Practical Seamanship

Essential Skills For The Modern Sailor

Steve & Linda
DASHEW

BEOWULF

Also by Steve and Linda Dashew:

Circumnavigator's Handbook
Bluewater Handbook
Offshore Cruising Encyclopedia: First Edition
Offshore Cruising Encyclopedia: Second Edition
In Search of the Perfect Yacht
Mariner's Weather Handbook
Surviving the Storm: Coastal and Offshore Tactics
Dashew Offshore Video
Beowulf: The Epic Continues Video

Visit us on the internet at **http://www.setsail.com**

Register your book at **register@setsail.com**

Library of Congress Catalog Card Number 00-093461
Dashew, Steve and Linda, 1941-
Practical Seamanship

Copyright 2001, Beowulf, Inc.

All rights reserved. No part of this CD-ROM may be reproduced or used in any form or by any means—graphic, electronic, or mechanical, including photocopying, taping, or information storage and retrieval systems without the written permission of the publishers.

CD-ROM release history:
Version 2.1 February 2001

Beowulf, Inc.
PMB 163 - 4740 East Sunrise Drive
Tucson, Arizona 85718 USA
www.SetSail.com

CD-ROM designed and produced by
Elyse Dashew, EDX Communications

Help

It wasn't that many years ago that sailors took pride in their seamanship. It was these skills, after all, which kept them safe, helped them to make a living, and brought approval in the eyes of their contemporaries.

Study this image of the schooner Mariette, every inch of her canvas set perfectly as she slides along on a beam reach. She's one of Nathaniel Herreshoff's wonderful designs. Built in 1915, when she's reaching like this there are few modern megayachts which can sail with her.

Her history and the way she is handled today is an inspiration to all modern sailors.

Dedication

The world of cruising is driven by dreamers. Dreamers design and build the boats (otherwise they would be doing something more profitable), and dreamers buy the products in hopes of fulfilling their own vision—whether a weekend cruise or an open-ended circumnavigation.

And while most boats sit tied to the dock, to be used only on occasion, a very few actually head out towards the unknown. Perhaps it is a two-week cruise to Martha's Vineyard or the Channel Islands from home port. Or maybe it's to Mexico with thoughts of the South Pacific. Wherever they sail, these folks are making their dreams come true. And it is the "doers," those making it happen, to whom we dedicate *Practical Seamanship*.

Table of Contents

Help

Help

Help

Help

Help

The good old days? Hardly. It is conditions like you see here, with the crew battling hurricane-strength winds off the pitch of Cape Horn, which gave rise to the phrase "wooden ships and iron men".

To be commercially successful and to reach port safely, you had to have a mixture of skill and luck. Master and crew learned to cope with whatever nature threw at them—or they didn't make it.

The skills learned over centuries of seafaring were passed from generation to generation.

Today when we head out the odds are much more in our favor. We know where we are with precision, in all types of inclement weather. We have strong boats and rigs, furling systems to make short-handed sail changes and reefing simple, and for the most part excellent information about the areas in which we sail. Yet there are times where the skills that were second nature to the men in this photograph are essential, even to modern sailors. (Photo courtesy of the National Maritime Museum.)

Introduction

One of the great pleasures that comes from working with a boat is the feeling of a job well done. This applies to a maneuver as simple as an upwind docking, or as complex as backing out of an anchorage under sail—and no matter how well you and your crew pull off the maneuver in question it can always be done a little bit better the next time.

Regardless of how much experience one acquires, there is always something new to learn. The mix of wind, wave, boat design, and crew is always changing. Rarely will you find two situations that are exactly alike. Every time you head out, whether for a day sail or a long passage, you will be gathering new data, and improving your techniques of seamanship along the way.

This creative mix is really a form of art, and you are the artist. As your own skills and knowledge increase you will find ever-increasing pleasure in this practice of seamanship.

Our goal in this volume is to lay out for you the basic tenets of *Practical Seamanship*, as we and other experienced sailors have learned them over the years, so that you may enjoy seamanship as an end in itself—and reap the rewards of safety, comfort, and peace of mind which come from this knowledge.

We'll then go into a range of specialized knowledge and skills which will provide you with additional tools should they ever be required.

This book is designed so that you can use this knowledge as a *foundation* to build on with your own experience. But keep in mind that seamanship is the response to an ever-changing pattern of the elements, your own vessel, and personal experience level and as such *there are rarely any iron-clad rules*.

Respect for the sea:

The two most important things you need for successful cruising are *respect* for the sea and its mate the weather, and an understanding of how their changeable moods can affect you in various situations. As your situation changes try playing "what if?" games, creating scenarios from the present situation in which things suddenly, rapidly begin to change, even deteriorate. How do you react if.........happens?

Look at your day-to-day seamanship as a continuing course in higher education. Search for ways of improving your techniques in boat handling. Experiment, try new things, push yourself and the boat to determine (under controllable circumstances) where the limits lie.

Prioritize Your Time

Whether you are getting ready for a long-term cruise or a summer vacation, with the hours required for preparing the yacht and putting personal business in order, not to mention holding down a job, most people find little time for actually sailing, let alone practice, before the day arrives to shove off.

You are forced to prioritize your time. The key is what goes at the top of the list. Having been through this process ourselves we feel strongly that you will get the best return on time invested by *using* the boat—getting to know how to handle it in all sorts of situations as well as testing the gear and systems—as opposed to working on it. Yes, this will cut into the gear you buy and add on, but it's better to put off those decisions until you've been out there cruising awhile, anyway.

Defensive Seamanship

Throughout this book you will find us referring to the concept of "Defensive Seamanship". This is much the same as the practice of defensive driving you probably learned in driver's education years ago. At sea it manifests itself by constantly being aware of the weather, the sea state, boat, and crew.

Linda and Steve Dashew aboard Beowulf, Marigot Bay, St. Lucia. Beowulf, shown below, is our present boat. She is 78 feet (23.9 meters) overall, very quick, and extremely powerful. With just two of us aboard we need to keep ahead of her requirements.

When something doesn't seem right, the time to act is now, without delay. This applies to leaving an exposed anchorage at the first hint of trouble, reefing early if the weather is unstable, or changing the V-belts on the engine because they are a little worn.

The key to defensive seamanship is staying alert and acting early, before a situation can deteriorate to where your options are limited.

Staying Current

One of the problems we all have is staying current in our thinking and skills. We learn a subject backwards and forwards, put the knowledge to good use on a passage or summer vacation, and then you shift gears sitting at anchor for a period of time or return to a land-based existence. That knowledge, so sharp a few months before, recedes to the background. The next time we go out it may take awhile before things spring back into focus. If there's some adrenaline thrown into the pot it may be even more difficult to remember what it was you learned.

From our perspective it always takes a day or two aboard before we settle into the well-worn routine that the two of us are used to. To aid ourselves in this process we have a notebook we keep with a series of check lists to get us up to speed. Throughout this book you will find many check lists and/or executive summaries designed to help you do the same.

Intermezzo (left, top) was a 50-foot (15.4-meter) CCA racer/cruiser design. She had long, inefficient overhangs and a hull shape optimized for light airs, with minimum wetted surface. And she was tender.

The result was a boat which was far more difficult to handle for the two of us than our larger yachts. In order to make good time it was necessary to be constantly changing the sail inventory, so that she was optimized for the existing conditions, and not overpowered.

Intermezzo II (middle left) was a 62-foot (19-meter) cutter which we built in Cape Town, South Africa (she was the second boat in our Deerfoot series). Compared to her smaller predecessor, she was a dream to handle. The year following our sail from Cape Town to the West Indies on Intermezzo we made the trip on Intermezzo II. The passage was a week shorter, and all four us put on a good deal of weight!

Sundeer (bottom right photo) was 67 feet (20.6 meters) long with a somewhat more conventional rig than Beowulf. The two of us regularly carried spinnakers on our ocean passages. While she was a relatively powerful vessel, she was sufficiently smaller than Beowulf that we did not have to be as much ahead of the weather as is now required.

Crew Size

The two of us have spent almost all of our time at sea sailing as a couple (with the kids when they still lived with us). Some people would call this short-handed, and it does mean longer watches offshore. But when we are in port we have the boat completely to ourselves, and are totally on our own schedule. We each know that we can rely on the other to adhere to the basic rules of seamanship that we've always sailed by. There is a significant amount of comfort to be taken from that.

As a result of this the techniques we've developed for all aspects of seamanship are based on a single person being on watch most of the time, with the ability to call on a second set of hands if the situation requires.

It is this same approach which we bring to this text.

Help

Check Lists

It has been over 50 years now since we first learned the rules for converting a true course to a magnetic heading and visa versa. After doing this thousands of times we cannot remember from one passage to the next how it goes—so we have a little card with the basic data on it which we put next to the radar as a reminder. If any of you are pilots you know that much of flying is based on check lists—before a flight, during, and when landing check lists are the norm for commercial and private pilots.

If it works for flying it ought to work in sailing. We have taken this approach to the most important data in this book. You will find a check list for many of the situations. Once you have the book learning out of the way, we hope these will serve as a helpful reminder when required. This data is also available on the CD-ROM and you are, of course, free to print this out and use it in the most efficient manner for your personal needs.

When dealing with the topics in this book there are many opportunities to go into appropriate equipment and design-related issues. While we have touched on some of these equipment issues you will find detailed explanations in our book *Offshore Cruising Encyclopedia*. Where appropriate, we've made cross-references to aid you in researching these topics further.

Stay In Touch

We love to hear from our readers. If you find something you don't understand or want to see more of, let us know. We'll try to attend to your desires in future editions. The best way to do this is by e-mail (**beowulf@setsail.com**), or by writing us (Dashew, PMB 163, 4740 East Sunrise Drive, Tucson, AZ 85718, USA).

Register Your Book

If you purchased your book directly from Beowulf we'll have your name and address in our computer. If the book was a gift, or purchased from a book or marine store, send us an e-mail at **register@setsail.com** or write us at the address above with your name, regular mail and e-mail address. This way we'll be able to notify you when the new workbooks come out.

Visit Us On the Internet

Stay up to date on the latest cruising information by visiting us at **http://www.SetSail.com**. You'll find the most up-to-date data on seamanship, the best cruising links on the web, FAQs, technical discussions, and weekly reports from around the cruising world.

Priorities

We'd like to close with a reminder on priorities. The single most important thing you can do to make your cruising successful is to get up to speed with your skills of seamanship. This is more important than any lifestyle-oriented gear or system you can think of. It adds immeasurably to your pleasure, reduces everyone's anxieties, gets you there faster and in more comfort. It also makes cruising much more fun. The odds of enjoying your time on the water will be much more in your favor if you take this approach.

ACKNOWLEDGEMENTS

Although our names appear as authors, this book is really a collection of wisdom gleaned from a lifetime of exchanging ideas and stories with sailors from around the world. There are literally hundreds of people whom we should thank, and even then we'd be leaving out a lot.

Our own learning about the sea started with practical lessons at the knee of Steve's dad, Stanley Dashew. Stan is in his 80s now, and still sails into his downwind slip on each birthday, to make sure he hasn't lost the touch. He is an inspiration to all sailors.

John Rousmaniere and Ralph Naranjo, both authors in their own right, have spent countless hours with us on the subject of seamanship and how to teach it.

Rocka Romke put us in touch with many of the professional sailors we interviewed for this book.

Numerous sailors have shared their mistakes and allowed us to use them as lessons, so others can avoid the problems they encountered. We know this must have been difficult and are grateful for the effort it took on their parts.

On the production side, Greg Jones, Editor of *Sailing* helped us with the editing, while Ginger Leigh managed to keystroke Greg's corrections in record time. Chrystal Lambert kept the office running while Elyse Dashew was busy with editing and taking care of the many production details entailed in a project like this. Sarah Dashew took her usual sagacious editing pass as well.

Putting together a collection of photos is always a chore. We appreciate the efforts of the folks at Stock Newport, Richard Bennett, Tim Wright, and the United States Coast Guard in this context. We especially thank Chuck Tobias for getting us the photo at the beginning of the introduction. Al and Beth Liggett generously shared their typhoon photos as well as their knowledge on the subject. Chuck Hawley shared both his expertise and photos.

Dan Neri gave us excellent input on sail trim and boat speed, and Phil Garland of Hall Rigging helped with our section on running rigging and jury rigging.

Doug Lochner at HLI Systems in Ojai, California did the basic book and cover design, and is our computer guru as well.

We'll see you cruising!

Linda & Steve

PREPARATION

Some folks feel that the level of preparation they need to go sailing varies according to the type of cruising they plan. While this proposition sounds reasonable on its face it falls down in operation. You can never be 100-percent sure of the wind and sea conditions that you are going to encounter. The line between onshore and offshore sailing grows thinner with more experience.

Defensive seamanship goes hand-in-hand with defensive preparation. In the end we all hope the details that are attended to in advance go unused. But to deal with the sea on an equal basis you must have the cards stacked in your favor.

It is often the case that one small problem leads to another, and then that to something else. Before long this chain of events, coupled with a lack of knowledge of how to handle the conditions leads to fear among the crew. Fear leads to inaction, and then trouble, perhaps requiring outside assistance.

Al and Beth Liggett's Sunflower, anchored at the south end of the Solomon Islands.

It is so much better to be prepared in advance.

This does not have to cost a huge amount of money. With a few simple tools and basic do-it-yourself skills the seaworthiness of your boat can be substantially upgraded.

PRE-DEPARTURE SURVEY

It is rare that a major problem *begins* with a catastrophic failure. It is much more likely that there will be warning signs of problems. If you catch these early, they can be corrected with a modest amount of work and expense. This is obviously a more favorable scenario that dealing with a disaster at sea!

Access

A key ingredient in this survey is access. While there is not a lot you can do after the boat has been built, this issue should be in the back of your mind when you acquire your yacht, and when you decide how much gear to load aboard (and where it will be stored). It is best to keep critical equipment easily accessible. Seacocks, for example, are frequently found at the bottom of storage lockers. Space should be left so that they can be inspected and worked on or checked for a leak without having to empty the locker first.

Steering Gear

Usually we start our pre-departure preparation at the aft end of the yacht and work forward. The steering cables are checked for meat hooks indicating fatigue with special attention paid to the swaged fittings at each end. Grease is pumped into the rudder bearings if required, and we make

Help

a careful inspection of the steering chain, looking for cracks in the links. We check the cable tension and look at the steering pulleys to be sure the cable is running true. We remind ourselves where the emergency rudder is stowed, how to rig the emergency tiller, and note that the relieving tackles are still in their special bag (we use a three-to-one pulley system led from each side of the end of the tiller to the companionway hatch for steering with the emergency tiller).

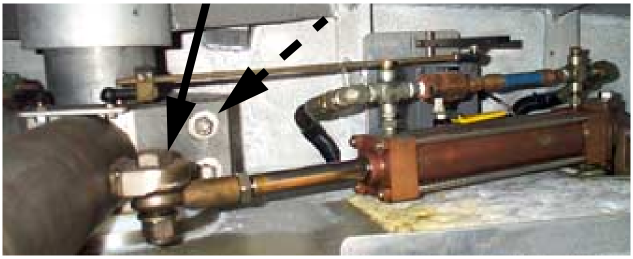
Both photos Edson International

A blown-up photo of a piece of steering chain. Note the hairline cracks (arrows). It is a good idea to check the steering chain at least once a year and before every major passage. Using a magnifying glass and a strong light helps the process. The most common points for chain to fail is around the outer perimeter of the links as shown above.

Along with checking the steering cables for broken strands ("meat hooks") also make sure they are tight and properly aligned. In the left photo the cable exits the quadrant at a slight angle. This will lead to premature wear.

Through-Hull Fittings

The next step is to check every through-hull fitting, make sure the soft wood plugs hang nearby, and that all valve handles are easy to close. At the same time we give a quick glance at the double hose clamps, making sure rust isn't (yet) taking its toll, and keep an eye out for chafe on any of the hoses or electrical cables which are nearby in the bilge. (We make a habit of putting chafe guards, usually made of PVC or vinyl hose over any wire or plumbing that vibrates, or that touches any machinery that vibrates.)



With hydraulic systems check all connecting bolts paying special attention to the clevis bolt which attaches the cylinder to the quadrant or tiller arm (above-solid black arrow). Also check bolts which connect the system to the rudder (dashed arrow) and base (below). Keep an eye out for leaks which usually start small and then grow.

Self-Steering

If your upcoming passage is of significant length then self-steering is going to be one of the most

Help

A tapered, soft wood plug should be stored near every through-hull fitting.

important categories of gear. With windvanes it is a good idea to check connection bolts, look for chafe on control lines, and then generally make sure that all assembly pins and/or fasteners are tight and properly safetied so they cannot work loose.

Make sure the autopilot is dry, wiring connections are tight and clean, and of course that it operates properly. Also, pay close attention to drive motor mounting bolts and the attachment to the rudder shaft or steering quadrant.

Propulsion Machinery

The engine and its accessories are inspected. V-belt tension and alignment is checked, as are all of the brackets supporting these devices. *Be sure to keep an eye out for cracks around bends, holes or welds.* If it has been awhile, check that the shaft coupling is tight, and that the motor mounts, their bolts, and all other bolts on brackets which vibrate are torqued up to the proper tension. The salt water strainer is cleaned, the engine cooling pump impeller is checked, and we change the fuel filters if they are close to their due date—this is a lot easier to do in port than offshore.We also like to check the stuffing box to make sure that it is properly adjusted.

We look at the battery terminals, making sure they're clean and tight, then top off the battery cells with water. All electrical and mechanical systems not used on a daily basis are run to make sure they are working.

A common area for problems is the shaft coupling or flexible joint (above) between transmission and prop shaft. We check the bolts before every long passage and at least once every 100 engine hours. If a flex coupling is used watch for signs of fatigue (cracking is common). Alternator belt tension and brackets are checked every 100 hours, too.

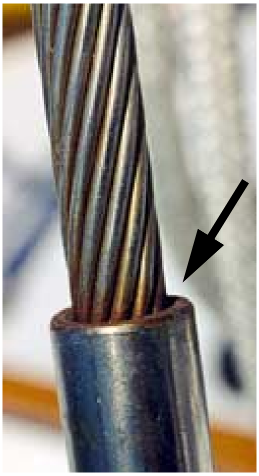
The Rig

While rig failures are rare, when they do occur it can be expensive, potentially dangerous, and downright annoying. Happily, you can almost always spot incipient problems, allowing adequate time for corrective action.

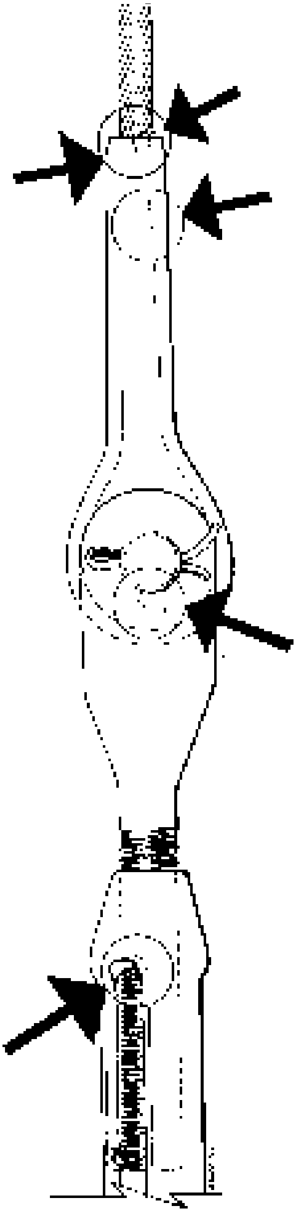
We like to start with the base of the rig, checking that the basic tune feels right, and that all clevis pins are correctly installed with cotter keys properly splayed. At the same time look closely at the turnbuckles. Check that the toggle action is smooth, and inspect the barrels and threads for signs of cracking.

Then take a close look at the end fittings of rigging wire, looking for cracks in the eyes or jaws (typically these start on the inside of the clevis pin hole). Also look for broken strands of wire at the exit of the terminals.

Help



Check swage fittings (left) for cracks and for broken strands, especially where the wire exits the swage (arrow). Check turnbuckles (right photo) where the threads exit the body, and around the holes of the clevis pins.

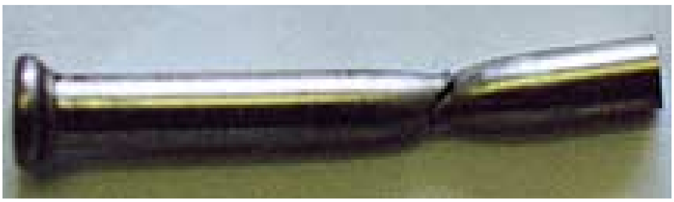


Bill Seifert

Three examples of potential or actual failure. Above left, a crack on a cold headed rod fitting.

Above right, once a shackle pin has yielded it may continue to hold, but the factor of safety in its design has been used up. This is also a sign that the shackle is undersized for the job it is doing. Go to a higher strength material, or larger size shackle.

Below, a piece of rod rigging which has failed. Note the necking down in the area of the break. While rod does not usually give warning signs of incipient failure (one of its drawbacks) close inspection of terminations and spreader bends will occasionally turn up signs of fatigue, before catastrophic failure.



More rigs fail due to turnbuckle and terminal problems than any other cause—which almost always can be caught in advance, if the rig is checked.

Look for cracks around clevis pins, threads, and along swages. Also check wire for broken strands where it exits terminals.

Turnbuckles should have articulating clevises at both ends. This allows for misalignment and flexing, without kinking the wire. If the clevis and pin are tight, they should be lubed so they will move freely. Also, lube the pin through the wire terminal so it is easy to remove in a hurry, if you are ever dismasted.

Note how the split pin is protected by tape.

In the lower photo the split pin is protected with a dab of silicone. Look closely and you will notice a bit of space between the clevis and pin at the top. In this case it is from a slightly undersized pin. If this were from elongation, due to stress in the metal, reenforcing the hole should be considered (or replacing the clevis itself).

Opposite photo, using Tef-Gel, Lanocoat, or similar high quality lubricants on toggles, turnbuckles, and clevis pins assures easy disassembly—a critical factor in an emergency.

All of these close inspections will benefit from a magnifying glass.

Next, move on to the boom and have a good look at the weldments on the forward end where the boom intersects with the gooseneck. Do the same for the gooseneck on the mast. If this is welded, keep an eye out for cracks. If it is bolted on, make sure that all fasteners are tight.

Then move down the boom and look at vang hardware and then main sheet attachment. Be sure that outhaul and reef sheaves are free running and watch for chafe on these control lines.

It will take a trip aloft for the rest of the rig inspection and will check each tang, terminal, and related wire for cracks, as well as the security of the clevis pins.

Pay particular attention to spreader bases, both on the mast and the spreader itself. These are under long-term reversing loads and are a common failure point.

I like to inspect everything on the way up, and then as Linda lowers me down I spray a bit of Teflon-based lubricant into the sail track.

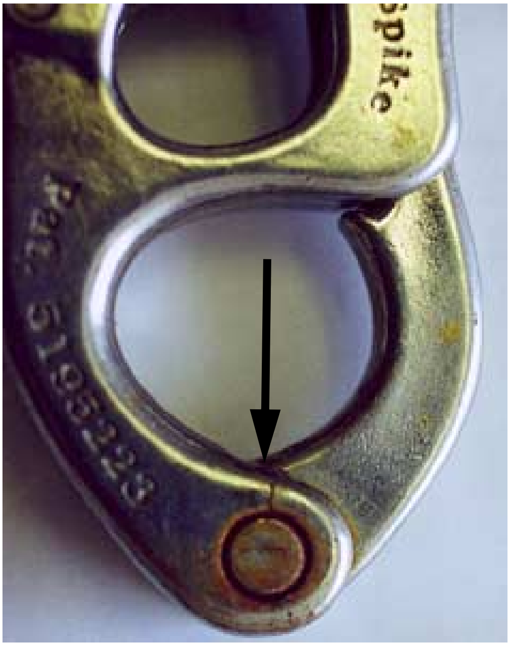
Help

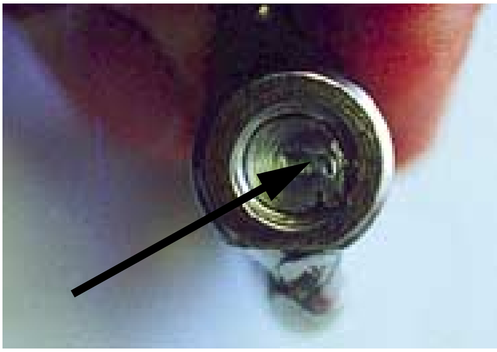
Shackles which work back and forth or which are up the mast need to be wired shut. Stranded seizing wire (shown in the upper left photo) is best. The solid wire tends to break more easily. This is a tack shackle for a mainsail so it does a lot of flopping around. Check that the nut (or split pin) which secures the fitting is tight—they have a tendency to work loose over time. Split pins should be cut to length so they just protrude through the pin as in the upper right photo. Note how the edges are spread just enough to keep the split pin from working its way out. This makes the split pin easier to remove (compared to bending it next to the clevis pin).

Spreader bases are often a problem area, especially when you are doing a lot of downwind sailing. Inspect the mast, base, and spreader carefully.

Red penetrating dye is being used here to look for tiny cracks. You can purchase this material at aircraft parts suppliers and some machine shop supply houses.

Shroud tangs almost always leak at some point. A flexible sealant or soft neoprene gasket will hold water at bay for awhile. However, to keep these watertight they need to be re-sealed on a periodic basis. Note the small spread on the split pin (which will make it easier to remove).



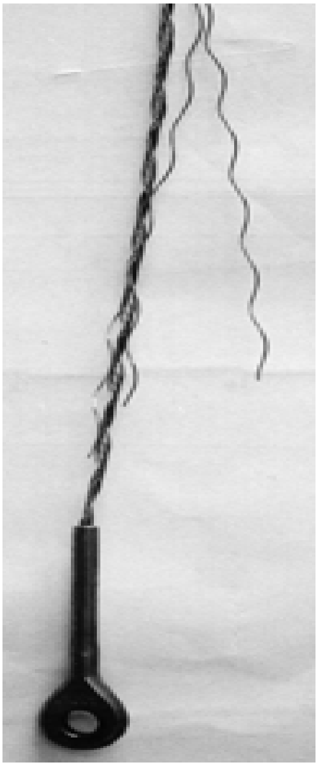


Upper left, snapshackles have a weak point at their hinge. Often cracks can be seen before total failure occurs.

Above right, a failed lifeline terminal. This type of problem can often be seen in its early stages as a tiny crack where the threads exit the terminal fitting.

Below left, this wire failed on a small boat which spent most of its time on a mooring. The wave action against slack rigging was the culprit.

Below right, rather than use split pins to lock turnbuckles try several turns of Spectra line through the bodies.



With roller-furling it is a good idea to periodically drop the headsail and then slide down the headstay, checking connections on the roller-furler extrusion. Pay particular attention to the joints in the system and look for loose fasteners.

Sails

The seams on all sails should be double checked for chafe. This is more critical on cross-cut sails as the seams are load-bearing and the stitching is how the load is transferred from one panel to the next (what could have been a minor seam repair job can lead to a blown-out sail).

Batten pockets should be checked for chafe and to make sure that their ends are sewn shut so battens cannot fly out when the sail is luffing, and of course you will want to be sure that the battens themselves are not broken.

Take a quick look at the sail corners, paying particular attention to the clews.

One area where headsails are vulnerable is along the leech. Most sailmakers will add a reinforcing patch to each seam, but if stitching starts to deteriorate on this highly loaded part of the sail, a quick leech-to-luff tear will result.

If you have a luff tape look for signs of chafe. This usually first develops where the sails sit in the luff feeder at full hoist.

You will want to check for chafe where the sails touch the spreaders on both overlapping headsails and the main and where the foot of the jib crosses the lifelines or pulpit.

The last thing to check is sail hardware. On the mainsail, give a quick look at slides, paying particular attention to the headboard. If you are using

Of all the areas which give trouble on rigs, nothing is more prone than the gooseneck, where the main boom attaches to the mast. Mechanical fasteners tend to work loose over time, and as they loosen the load shifts to the remaining tight fasteners, hastening their demise. Check the tightness of the gooseneck before every passage, and during long passages. Keep an eye on connecting links, bolts, and welds in this area as well. At least once a year remove the boom and disassemble the hardware.

A bulletproof (and spreader proof) chafe patch. UHMW plastic sheeting, 2-millimeter (1/16-inch) thick takes the load. It is held in place by a patch of sail cloth material. This can be as light as insignia cloth (sticky back) or cloth the same weight as the sail.

Baggywrinkle (right photo) was used in the olden days to keep sails off rough galvanized wire. Today smooth wire and synthetic chafe gear on the sails reduces the problems. Dacron is most commonly used. However, Spectra is much more chafe resistant.

The best chafe gear is UHMW plastic shown on the batten pockets in the photo below. This is amazingly tough and will not wear through. This is what we use on Beowulf's main and mizzen (shown here) and it has stood up for 28,000 miles as this is written.

plastic slides make sure none of them are cracked or worn down. Webbing between the slides and sail should be fresh without inside chafe.

Hanked-on headsails (especially rarely used storm canvas) need to have the piston hanks worked with a drop of oil placed on each.

Chafe

At the same time the rig is being checked for structural integrity it is a good idea to keep an eye open for rough spots, split pins, tang bolts, etc. which can snag and/or chafe sails.

When we go aloft we carry a tube of Sikaflex or Silicone along with duct tape. Every cotter key is protected, we wrap all of the tangs so the pins can't catch on sails, and tape the spreader ends as well.

Chafe like that shown in the three images to the left can happen rapidly if your lines are not led fair between turning points.

The chafe shown on the top photo has eaten through the cover, but the core is intact. This will often carry the load, especially if the core is Spectra or Vectran. If this occurs, seize the cover so it doesn't continue to unravel (below).

If there are any bolts or screws with sharp edges on their heads, these are given a dose of goop to cover them.

At deck level we protect all split pins and any hardware which looks like it might catch the spinnaker. Don't forget the wire on seized shackles, which can snag lightweight sail cloth.

Running Rigging

Assuming your running rigging is properly sized the two issues which will create problems over time are chafe and ultraviolet radiation from the sun.

With halyards it makes sense to check the ends where they ride over the mast head sheaves *when hoisted*, as well as any areas which spend time in jammers and where they exit the mast. Once a year it is worth pulling halyards out of the mast and checking the entire length, just to be sure there are no internal chafe spots, from hardware in the mast, which would otherwise go undetected.

Having a deck knife ready to use in the cockpit and at the mast is handy, and in an emergency can be a tremendous asset (upper left). A sewn whipping is neater and lasts longer than tape or burning the ends of running rigging (upper right).

This series of four photos will give you an idea of a way to clean up chafe problems and prolong the life of sheets and halyards. In the left photo we see a heavily chafed halyard.We've stripped the cover off a piece of 1/2-inch (12.6 millimeter) polyester line and slipped it over the end of damaged halyard. The next image shows the cover worked over the chafed area. The narrow spot indicates the chafed section. The third photo (above) shows the end of the cover which has been seized (we taper the ends of the cover to make this neater). We usually make the cover a couple of feet (0.6 meters) long and then do a bit of hand sewing through it to help it carry the load.

Adding an extra cover also works to prevent problems (for example with spinnaker halyards), if done in advance (photo below).

Help

Deck-level rigging, sheets, guys, and control lines all need to be inspected as well.

If you are about to embark on a long passage for the first time, and your vessel has been left rigged for four or five years, check to see that your running rigging hasn't been excessively degraded by exposure to sunlight or ozone. There are a couple of things to watch for. One is a brittleness of the cover, with small pieces of broken rope sticking out from the core. Another is substantial fading.

A simple way of testing running rigging is to tie one end to a cleat, and then take the other to a primary winch. Grind to about 50-percent more load than what you do when sailing in a stiff breeze. If the line doesn't fail, you should be okay for another season.

The bales with which sheets are attached to booms are a potential source of problems. The sheet load pulls from side to side, a reversing load as the boat tacks or jibes, which is hard on the metal. Fatigue, especially around holes or welds is common. For many years now we've made sheet attachments with rope bales which do not have the same tendency to fatigue over time as does metal—a good replacement if (or when) your bales start to show signs of age.

Where the mainsheet blocks attach to traveler cars is a continuing source of problems. Make sure these are wired shut (and then tape the wire so it won't catch any spinnakers which are brought aft). Check any fasteners in use to assemble the cars and bales while you are in the area. Also make sure track end stops are in good condition, and tight.

Help

Deck Hardware

Give lifeline bales a close inspection, especially at the welds (white arrow) where they are attached to the stanchions. These tend to develop cracks over the years.

Winches are generally trouble-free as long as the pawls and related springs are clean and in good shape. However, if these are dirty, or some are missing, this could lead to a catastrophic failure and injury to the crew. While all winches should be serviced annually, we like to double-check the pawls every six months.

Check that your blocks are free-running, that their connecting shackles are tight (even better, shackle clevis pins should be wired shut), and that the lead is fair.

Do the same with traveler cars, making sure that they run easily on their tracks.

Many modern travelers depend on circulating balls to reduce friction. These tend to flatten out in some high-load applications, making it difficult for the travelers to move when loaded. Replacing these balls is usually a simple task.

Lifeline Systems

It is always safest to tie off pelican hooks which are used at lifeline gates. This prevents accidental openings. However, it is best to use a square knot rather than a granny as shown.

Most lifeline systems depend on lightweight stainless bales, welded to stanchions for attachment of the lifelines themselves. Because of the tiny welds typically used, it is not unusual for a crack to appear, and then for the welded bale to eventually fail under load. Obviously you want to keep a close eye on these!

At the same time examine the swaged fittings for cracks and broken strands. Make sure turnbuckles are safetied.

We like to seize pelican hooks with light line so that they cannot accidently open.

Most lifelines are made from plastic coated stainless wire. This looks nice, and works fine for a few years. But you can eventually get anaerobic corrosion of the stainless wire inside the plastic coating. As a result, it is a good idea to replace the top lifelines every three or four years.

Safety Gear

We normally keep our jackstays (to which our safety harnesses are attached) stowed when we are at anchor. This keeps the webbing out of the sunlight which eventually weakens it. So, before we head offshore

Drying out in Bermuda. It is always better to find leaks before you head to sea!

When it gets really wet on deck, it is amazing how much water will find its way below unless fittings, hatches, and lockers have been well sealed. A high-pressure washer is an excellent leak-finding tool.

we get the jackstays out and secure them. We also rig our pennants which are attached right at the companionway entrance.

We like to have the harnesses hanging ready to use before we depart.

We then give a look at the raft and its lashings.

If flashlight batteries are older than six months, we replace them with fresh supplies. We also change the batteries on our personal strobe lights and man overboard lighting.

Finally, our LifeSling attachments are checked.

Ground Tackle

When we're passaging close to land we take comfort in knowing that our primary anchoring system is ready to go should the need occur to use it in an emergency. If we're cruising in areas where running aground is high on the list of possibilities we keep a kedge anchor ready to go on the stern.

On the other hand, on many offshore passages we prefer to keep the weight off the bow and so remove the main anchor and stow it amidships or below decks.

In each case, the anchor(s) must be securely lashed. If there are no permanent chocks for storage (other than the bow or stern rollers) take care that the deck is chafe-protected.

Checking for Leaks

Nothing is more annoying than a leak below. Not only is it depressing, leaks can raise havoc with your electrical gear, mechanical systems, not to mention clothing, books, and bedding.

So of all the areas that should get checked before you head off, this is probably the most critical if you are to enjoy your passaging.

We begin with an inspection of areas that potentially could permit water to get belowdecks. Cockpit lockers should have good seals and be fitted with positive latches that are kept fastened while at sea. Every ventilator box, engine air intake and through-deck aperture must have a cap to seal it off. If your boat has a dorade box, be sure it has an inside cap, too, in case the deck box is lost.

Plugs or caps should also be available for each anchor pipe. Deck hatches should have tight-fitting storm covers to protect their gaskets from direct wave hits. Sliding hatches and washboards should have inside locks to prevent their opening if motion becomes severe or you experience an accidental knockdown. A simple barrel bolt will usually do the job.

Side windows and ports can be vulnerable in heavy going, and you should have storm shutters available for each one. Try them out in good weather and make sure they are easy to use when conditions get rough. Many experienced voyagers mount permanent heavy, clear plastic storm shutters on their boat's windows and ports.

The ultimate mast sealing system! Aboard Beowulf we start with the plastic boot supplied by Forespar which fits the extrusion. A bead of silicon is added to the top and bottom edges to try and help seal them.

Next comes the "secret weapon" shown in the top photo. This is a neoprene (wet suit material) gasket which fits over the Forespar boot. If the mast is out of the boat, it can be slipped over the bottom end prior to putting the spar back. Otherwise, it is glued together using appropriate neoprene cement.

Self bonding tape is then applied around the upper edge.

The upper and bottom edges are then sealed to the mast beneath by using moderately tight shock cord.

The entire assembly is then covered with a Sunbrella fabric sun shield.

A boot like this lasts about two years aboard Beowulf, and is the only way we've found to keep the mainmast dry where it penetrates the deck.

Storm covers (above) protect hatch gaskets and go a long way towards preventing hatch leaks (see Offshore Cruising Encyclopedia page 174 for more details).

Help

Companionway hatches are notorious sources of leaks in wet weather. Even a precisely fit slide, when directly hit with a breaking sea, will emit showers below. A 1-inch-by-4-inch (25-millimeter-by-100-millimeter) piece of teak fastened vertically to the cabin top just outboard of the hatch slide will deflect any seas that come aboard, keeping you much drier below.

More difficult to deal with are leaks from deck hardware, chain plates, mast boots, and faulty hatch gaskets.

The best approach we have found is to test anything which penetrates the deck with a high pressure hose. This will not catch every leak, but is a good start. You will want someone below, with a flashlight, to check as you move the hose.

Bilge pump control:

- ❏ It is best to have a manual override switch to operate bilge pumps if the float switches fail.
- ❏ Make sure that circuit protection (fuses or circuit breakers) are readily accessible.
- ❏ Using a relay between the float switch and pump, so the float switch only carries a signal current, will add to their reliability.

Be sure and watch inside of lockers, where stanchion bolts penetrate the deck, and at all other areas of bolted hardware.

Inspecting the hatch gaskets and hardware is easier. Watch for nicks in gaskets, test the resiliency, and make sure that when the hatch is dogged that the gasket is *evenly* compressed around the perimeter of the hatch.

Hatches which are prone to leaks can be improved with the addition of a preventative layer of duct tape over the hatch to deck joint.

Finally we come to the mast boot. Almost all mast boots leak, even those on multi-million dollar custom yachts. The key is to try and prevent the leaks from making your life miserable. Again, duct tape can provide a temporary boost to watertight integrity if wrapped around a suspect mast boot before departure.

Bilge Pumping

Despite all precautions, in heavy weather some water inevitably finds its way below. In order to ensure efficient removal of this water, *you must have clean bilges*. Although your bilge sump itself may appear clean, motion at sea can dislodge accumulated dirt, which will then clog your pumps. All pumps should have strainers, and both pump and strainer should be easily accessible for maintenance. Some installations will benefit from a strum box, a cagelike strainer built around the pump if it is a submersible model, or at the end of the hose if the pump is remote mounted. And remember to keep the limber holes clear: If you install through them a chain fastened directly to the hull at one end and tied down at the other end with shock cord, the chain can be pulled back and forth through the holes to free dirt easily and quickly.

You should have a large-capacity hand pump where it is easy to use in rough going. Many cruisers prefer to carry two hand pumps; one on deck close to the helmsman and a second below. Carry spare diaphragms and valves for your pumps, and know how to replace them.

The main engine water pump, if fitted with a T-junction and a simple valve on the incoming water side, will also act as an excellent emergency water pump.

Better yet, consider fitting an engine-driven pump especially for emergency use. Units that can pump up to 80 gallons per minute are available, and in a pinch one could save your boat. Electric pumps, whether submersible, impeller-driven or diaphragm-type, are handy for normal pumping, but you should not rely upon them for emergencies. You might also consider rigging a bilge-level alarm with a float switch and a buzzer to give you early warning of any problems.

Toggling float switches by hand shows us they, and the pumps to which they are connected, are in working order.

Securing the Interior

We also check that lockers are positively latched, that our saloon cushions are tied down, and that the baskets, carvings, etc. which we have around the interior at anchor are properly stowed.

Plants usually end up in the guest shower.

Next, we prepare the galley. If we're headed off on a long trip, with some likelihood of inclement weather, we'll make sure that our fridge and freezer are stored so that what we need is easily at hand. We have one area in the galley where snacks are usually stored at sea as well.

Finally, we make sure that the lockers are packed so that cans and bottles cannot start to roll around (there is nothing as annoying as a can rolling back and forth while you are trying to sleep!).

Electronics

We've left the electronics for last. However, this is actually the first thing we fire up before we leave. We usually have a weatherfax aboard and we run that for two to 10 days (or more) before we leave, both to check on weather reports and to make sure we have the right times and stations programmed in.

All other electronics (radios, sailing instruments, GPS, pilot, radar, etc.) are run for at least 12 hours the day before we leave, just to make sure everything is going as it should.

The process we've just spent the last few pages describing sounds very involved and time-consuming. The first time you go through the procedure this will be true. But as you become more familiar with your boat and gear, and know what you are looking for, it will become almost automatic.

Once you are up to speed you and your mate should be able to go through the entire process in a couple of hours. It is time well spent.

SHAKEDOWN CRUISE

The shakedown cruise is really just a long term, detailed sea trial. Properly planned, a shakedown sail can help to ferret out various onboard weaknesses that may have escaped notice while it's still easy to make corrections close to home.

The object is to test each of your boat's systems in the most aggressive mode possible, meaning in rough water as well as in calm.

This also applies to the crew. You should be testing yourselves at the same time. Finding out what can go wrong and what you have to do to repair the problem on a temporary or permanent basis is an essential cruising skill that is best learned by sailing close to home.

While heavy-weather work will eventually be required to help you learn the boat, it's always better to start off in moderate conditions. Just getting away from the dock for a week or two to see how your various systems work in a full-time use situation is a great help.

Engine room check list:

- ❏ Does the engine run at full load without overheating?
- ❏ Is the prop shaft true (no vibration)?
- ❏ V-belt tension.
- ❏ V-belt alignment.
- ❏ Hose and wiring chafe.
- ❏ Fuel filters—dirt or sediment present after powering in waves?
- ❏ Daily engine running time.
- ❏ Fridge system operation.

Mechanical Systems

The first thing you want to do is check out machinery. How does the engine perform at various rpm settings and under different load conditions, especially at full speed when overheating problems are most likely to be detected? You want to be sure that the engine runs smoothly at your normal cruise setting.

Watch for shaft vibration that could indicate an out-of-line engine. Are the motor mounts adequate? How about V-belt tension? Belts should be tight enough so that they only deflect slightly when you press down. Also check the alignment of the pulleys on the front of the engine and/or generator. They should be exactly in line with one another. After 10 or 15 hours of running, inspect the pulleys and belts for roughness. If the edges show signs of wearing or you see black dust, this is a sign that the belts are out of alignment.

We've already mentioned it but it is worth repeating that while you're checking out the machinery, have a look at all the hoses and wiring. You want to be sure that these won't be chafing as time goes on.

Loading the Engine

Try your engine out under heavy load. This means powering into a head sea and headwind. Push the engine right to the limit for 10 or 15 minutes and watch the temperature. You should be able to use full power without overheating. If the engine does overheat it usually indicates water flow or heat exchanger problems.

At the same time, rough-water powering will stir up any dirt or sediment in the bottom of your fuel tanks. Check the fuel filters after this session to see that they're still clean. If the filters show signs of dirt, empty and clean the tanks before heading out on your cruise.

The various engine-driven systems need to be checked for operation over a period of time. Alternator output and battery bank size versus your use of electrical current will only show up after you've been out for awhile. How long is it necessary to run the refrigerator each day?

If you're checking this in cool weather, say an ambient temperature of 70 degrees Fahrenheit, assume your running time will double when you get to the tropics.

How about the hot-water system? If it runs off the engine, does it heat quickly? With an AC generator on the engine you'll want to be sure that its operating range is close to your normal cruising rpm.

After eight or 10 hours of running time, have a look at the propeller shaft stuffing box. Be sure it has the right amount of leakage underway for cooling the packing, but not too much when you're sitting still. How difficult is it to adjust the packing nut? Try to make a minor adjustment. You may find that special tools are required to get at it. Then, be sure you can get good enough access to replace the packing when the time comes.

Maintenance Procedures

Take a look around the engine space and see what's required for various maintenance chores. Changing the oil is an exasperating project on most boats. How about a plumbed-in electric pump to remove and replace the oil? Can you get at the oil filter easily? Will you be able to remove it without making a mess in the bilge?

How about the fuel filter? You'll want to be able to change this quickly, without getting diesel all over the boat. It might even be a good idea to think about a double filter system, where you can switch from one filter to another with a Y-valve when changing dirty cartridges.

The most common problem with diesels is air in the fuel lines. Check out the bleeding process. If you take on a load of water-contaminated fuel, you'll get to know the bleeding process well.

Can you get at the starter motor solenoid to change it? How about pulling injectors? The cooling water pump impeller will have to be replaced at some point. Try removing its cover plate and actually changing to a new impeller.

More maintenance time aboard is spent with pumps and plumbing than any other gear. You'll want to run all bilge, sump, and pressure pumps for many hours to be sure they operate properly. Check all hoseclamps to see that they're tight. *Be sure the bilge pumps work on both tacks*. If you have a flat-bilged boat you may find that two pickups with a Y-valve are necessary to drain water on both tacks. Do the float switches activate the pumps properly? How about the bilge alarms? Again check how different heeling angles affect operation.

Are the bilges clean? A pump strainer that collects much dirt indicates a thorough cleaning of the bilges is in order.

Maintenance check. How do you deal with:

- ❏ Changing oil.
- ❏ Changing fuel filters.
- ❏ Bleeding the diesel fuel system.
- ❏ Adjusting the prop shaft stuffing box.
- ❏ Checking the shaft to transmission coupling.
- ❏ Checking steering system integrity.
- ❏ Changing water pump impeller.
- ❏ Cleaning raw water strainer.
- ❏ Servicing bilge pumps.
- ❏ Checking through-hull fittings.
- ❏ Tightening hose clamps.

Sailing trials:

- ❏ Set all sails and note sheet positions in log.
- ❏ Check use of storm canvas.
- ❏ Review tacking.
- ❏ Review jibing (especially in a breeze).
- ❏ Try all reefs.
- ❏ Attempt to change headsail on roller-furling stay.

Sail Trials

When you start to sail there are two areas to watch. First is sailhandling. You'll want to go through all the maneuvers that may take place offshore, in light airs at first, and then gradually work up to heavy winds.

This means setting and removing sails, and stowing and/or covering your sails to see that all works well.

You'll want to tack and jibe, set up and remove running backstays, reef, change headsails, set and remove light downwind canvas such as your spinnaker.

At the same time you're checking out sailhandling, take a look at the sheet leads. Are your foreguys and preventers easy to use? You may want to rig these so they come back to the cockpit if they are cleated off at the bow.

It's also important to get comfortable with your sailhandling "techniques." This will take some time, so don't be discouraged if at first you're a little rough around the edges. Things will improve with time! Remember to drag out the storm canvas and see how it sets. If you have roller-furling on the headstay, try changing your headsail offshore with a good breeze blowing. You may have to do this at some point in really heavy weather.

Standing rigging:

- ❏ Are the spars straight or set with pre-bend?
- ❏ Are they straight when sighting up the aft edges at the dock?
- ❏ Check fairness side-to-side when sailing.
- ❏ Check side-to-side fairness when reefed.

Rig Tune

With a new boat the first thing you will want to do once under sail is to check the rig tune and be sure that everything is more or less the way it should be. It is best if weather is moderate, with initial breezes in the 10- to 15-knot range.

Start out with sails eased (not strapped in) and have a look at the spar(s) to be sure there is a nice fair curve with no hard spots in the bend (forward) or that they are straight if that is the design, and there is a straight line side-to-side when sighting up the luff groove.

Tack, and check the situation again (it is normal for the rig to show different characteristics on different tacks, until it has been adjusted under load).

Make any adjustments necessary and go through the process again.

Once you are happy with the rig in this breeze, you will need to test it in stronger winds with both full sail and a reefed sail.

If this is your first time with tuning a rig of this nature, have a rigger explain to you what he is doing and why. You might want to do some tuning on your own one day.

If you have new wire, it is normal for the rigging to stretch a bit with the first few hundred miles of sailing, especially after you've had a chance to find some strong breezes.

After you have loaded the rig up take another look at the spars. You might want to have the rigger take the turnbuckles up just a hair. Or better yet, have him or her watch as *you* do the final tune on the rig, so you'll know what everything should feel like.

After a Couple of Days

After several days of sailing, closely examine all of your running rigging for signs of chafe. It may be necessary to relead some of the sheets, or work out a suitable system of chafing gear. Also have a look at your sails where they contact spreader ends and after lower shrouds. You'll probably want to have chafe patches sewn on.

At the conclusion of the sailing trials, the standing rigging should be checked for tune one final time.

Also check tangs, gooseneck fittings, the sail track where the headboard hits when reefed, split pins and boom vang fittings. If you have rig-control hydraulics aboard, look for signs of leakage at all hose connections and around the piston seals.

Try out the awnings. They should be easy to set and remove, and they should be usable in moderate winds. Awnings almost always require some modification after delivery from the sailmaker.

You'll want to use ground tackle to be sure the chain stows neatly, and then runs back out without fouling when you drop the hook. Make sure the anchor self-stows without banging the bow. *Check to see that the chain stays within the confines of the bow roller if the load on the chain is from the side*. If the cheeks of the anchor roller are too low, and you're caught in a wind-against-tide situation, the chain may jump off the roller and work its way down the side of the boat (see *Offshore Cruising Encyclopedia* page 52).

Review:
- ❏ Rig tension and tune after sailing for several days.
- ❏ Tangs.
- ❏ Goosenecks.
- ❏ Vangs.
- ❏ Split pins.
- ❏ Sail tracks (especially where headboard attaches).
- ❏ Try out awnings.

Ground tackle:
- ❏ Deploy all anchors.
- ❏ Does windlass work properly under load?
- ❏ Does chain flake cleanly?
- ❏ Does chain strip correctly off chain wheel?
- ❏ Chafe on anchor roller?

Electronics

All your electronic gear should be operated under sail and power. Radios and electronic gear often pick up electronic interference from other electrical equipment, so you'll want to try each piece of gear in turn while running all pumps, engines, inverters, etc. When interference is found it can frequently be reduced or eliminated by using special electrical filters, changing the grounding system or, in the final analysis, not running the offending equipment during critical periods. *Be especially careful to check out the autopilot when using the radio transmitters.* Sometimes the RF energy developed when transmitting interferes with pilot operation.

At the conclusion of your shakedown cruise have a look at the steering system. Are the cables still tight? How does the quadrant look? What about the rudder stops?

Run all electronics while engines and gensets are operating, to check for interference.

Cockpit Drains

Because a sea can inundate your cockpit, the cockpit drains must be capable of emptying the water within a minute or two at the most. While a majority of the water from a filling wave will be rolled out, the drains will have to do the work of emptying the footwell below sea level. On many modern boats with high freeboard, you can install large drains that lead aft from the cockpit straight through the transom. An average production 36-footer (11 meters) should have at least two drains, each at least 2 inches (50 millimeters) in diameter.

Intermezzo II reefed down with just the staysail set forward. She's close reaching towards Mexico, crossing the Gulf of Tehuantepec in a moderate gale.

Leaks (Again!)

Finally, and most importantly, you'll want to find any leaks that exist. No matter how watertight your vessel looks at the dock, or what testing you have done with a hose, when you are offshore with solid water sweeping across the deck, new leaks will develop.

These are frequently difficult to trace, since the final wet spot may be some distance from the actual leak. It will be much easier (and less frustrating) to check for leaks with your lockers empty. Check in corners along hull sides, under bunks, in the bilges—anywhere water might accumulate. At the same time be sure that whatever leaks do develop drain eventually to your bilge pump pickup points.

One of the keys to a successful shakedown is time. You need as much running time on your equipment as possible. And you need hours at sea just getting used to the boat, sail handling and working with the various systems on board. Try for a solid two-week period away from the dock.

Don't be discouraged when you return to the dock with a list many pages long. It's part of getting ready to go cruising. Just think how much easier it will be to make the repairs and modifications when the local marine store is just around the corner.

Clearing the Decks

Where to store gear is a problem we all face. Sails, covers, awnings, spare ground tackle, dive gear, and even outboards, not to mention spare fuel and water, sometimes end up being lashed on deck. It is a dangerous and unseamanlike procedure, but one many of us accept as necessary from time to time.

The problem comes in assessing the danger. At the dock or in a calm anchorage, gear on deck looks well secured, of no major concern. But offshore with solid water sweeping on board, the gear not only may be lost but can wreak havoc with deck structures and crew if it comes adrift.

Several decades ago the powerful ocean-racing sloop *Sorcery*, a C&C 61, was rolled 360 degrees and dismasted in a Force 9 to 10 gale while crossing the Pacific from Japan to the United States. She was carrying spare diesel fuel on deck in 44-gallon (165-liter) drums, several of which washed overboard. One did not. It ended up in the cockpit, on the leg of a young crewmember. She suffered a severe compound fracture and was lucky to survive the ordeal.

Don’t Compromise Your Stability

All that weight on deck also compromises a boat’s stability. The boat will be more tender than she would be if her gear were stored below or eliminated altogether. Reducing stability at best means an uncomfortable ride. At worst it may make it impossible to sail off a lee shore.

Join us now for a trip along the coast of Central America. A short, steep swell lifts our bow as we motorsail northwest towards Mexico and the Gulf of Tehuantepec just 50 miles ahead. *Intermezzo II* is making good time under main, yankee, and iron genoa. The southerly breeze, what little there is, barely keeps the sails filled and our motion steady.

Sailing directions, cruising guides, and yachting folklore all give the gulf and its infamous northers quite a reputation. Even the southbound ships we talk with speak of it with respect. Linda is nervous. All these comments about steep seas and high winds has her adrenaline flowing before there’s even a hint of action.

“Don’t worry,” I say reassuringly. “We don’t have to deal with a Gulf Stream or the Agulhas Current here, and there isn’t sufficient fetch for a big sea to build. Besides, we can always duck into shore if it blows too hard.” Given some of the really bad conditions she has been through, I can’t understand her concern. “Regardless of what sort of weather we get, it can’t be as bad as what you’ve already seen.” Linda sees that as small consolation.

I make a turn around the decks, checking fittings, lashings, and sheets for chafe: best to do it now when the seas are calm. Even though we have never had solid water on deck, I throw an extra line around the dinghy.

Dinner is succulent roast chicken, fresh beets, and lobster salad, served early. Before Linda secures the galley she makes a double batch of popcorn. Popcorn is the mainstay of our existence when things get tough. The crew of *Intermezzo II* is ready for the norther.

The wind begins to swing to the northeast, a sure sign of action to come. The breeze, still light, is too far forward for headsails, as our apparent wind is almost on the nose. I am forced to douse the yankee. An hour later there’s more wind, and we are sailing; Mr. Perkins takes a well-earned rest as *Intermezzo II* charges ahead on a close reach. The wind finally plateaus in the 25-knot range, and with the yankee back up and a reef in the main, *Intermezzo II* is rapidly eating up the miles. Sailing like this, she is a thing of beauty. Her

Help

long waterline and powerful hull sections are at their best, and her steam gauge shows a steady 9.7 to 10 knots.

We are fortunate that the boat has ample stowage in her forepeak and engine room. Our decks are clean of extraneous gear, except for the dinghy nestled to port alongside the mast. We have not always been so lucky. On smaller boats we've needed to use more of the interior volume for living space, leaving less for boat gear, and the decks have not always been so ready for sea as *Intermezzo II*'s.

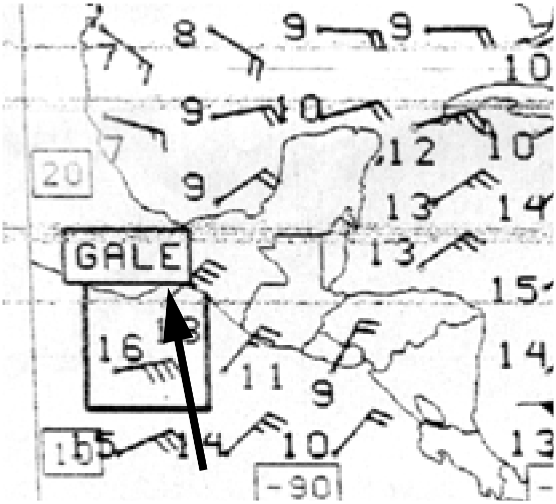
One of the difficulties in recognizing the change in your vessel's motion that results from all that gear on deck is that the gear accumulates slowly. Because the change is gradual, usually you don't notice the difference in how she handles. If you have a lot of weight topside, try leaving it at the dock for an afternoon sail. The difference in stiffness and boat speed will be enormous and readily apparent.

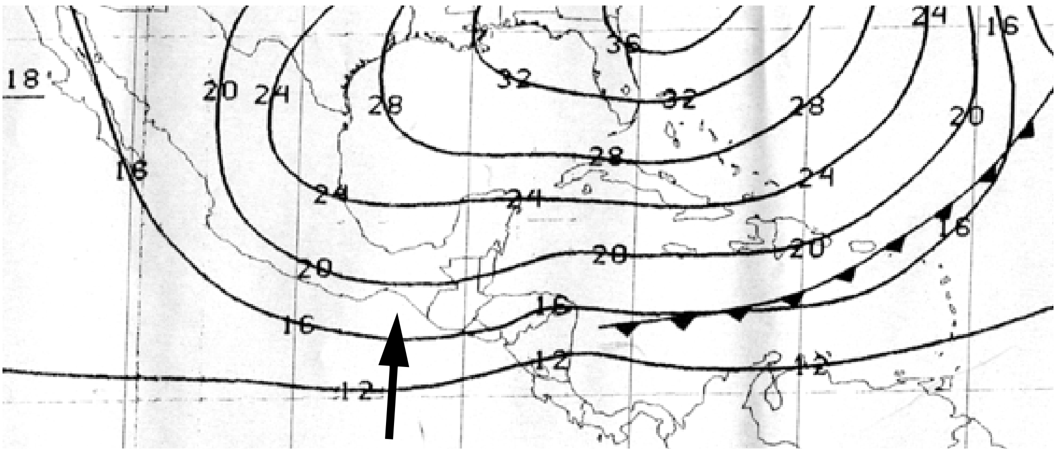
It is 2200, and the wind is beginning to build again. In the last two hours the barometer has risen 4 millibars. The high-pressure system caught behind the mountain range at the head of the gulf must be ready to spill over. I ask Linda to come on deck and bring the top to my foul weather gear. As I slip into my slicker I explain the coming sail changes.

Headsail Change

"Take the boat off the pilot. Hold her as high as you can without tacking. I want the jib to luff inboard. As soon as I drop it, head off a bit to keep from getting into irons. Once I have the yankee secured, I'll hoist the staysail. Flip the pilot back on then, and start to trim in the sheet." It sounds easy enough, but with the wind gusting into the 40s and a very steep 8- to

The mountains of the Gulf of Tehuantepec, at the bottom end of Mexico, act like a funnel for the trades on the Caribbean side. When they are pumping, odds are so will be the Tehuantepeckers! The two fax charts (below) are from our 2000 passage. The high pressure setup, and gale force winds in the gulf are a typical winter scenario—quite predictable and avoidable (the heavy black arrows indicate the Gulf).





Help

12-foot (2/4- to 3.7-meter) sea running, it will take a fair amount of skill on the helm to keep the yankee onboard and the foredeck crew relatively dry.

A flat section of sea comes our way, and Linda begins to head up. I clip my safety harness to the jackstay and quickly move forward. The yankee halyard is first flaked out on deck and knotted at the bitter end. The jib begins to luff. "Hold her just like that!" I holler aft.

I release the halyard and the sail drops halfway, and then wind pressure starts it climbing the headstay. I have to go to the bow to haul it down. It is a struggle to get the sail tied around the head and halyard. I work aft along the rail, securing the sail to the stanchions. Our bow netting takes care of the rest. In another minute the heavy staysail is up and luffing. Still dry, I move aft to help Linda winch in the last few feet.

Don't Procrastinate!

"Don't you think you should stow the yankee?" Linda asks.

"No, it will be okay. The seas aren't coming on board, and besides, I might get wet next time."

We tack to port to close with the weather shore, seeking the calming influence of land on sea. The wind continues to build. With it now blowing a steady 40-plus knots and gusting into the 50s, we understand from whence the steep seas have come. *Intermezzo II* blasts through the waves with little motion but much noise as the bigger waves try unsuccessfully to impede her progress.

Every now and then we pick up solid water. The waves, influenced by shore, head straight on our bow, and the tops of the bigger ones roll down the deck. Now I would like to stow the yankee in the forepeak, but working by myself up forward in these conditions would be very difficult. I decide to chance riding out the situation until we are closer to shore and in smoother water.

Twelve miles from the weather shore we run into an enormous fleet of fishing vessels out working the shallow banks. Linda counts 40 radar targets at one time. We will have to stand offshore, outside of them. We are stuck in the heavy seas.

Dawn arrives, and the wind seems to increase in the gusts, but as we close the shore, the seas are rapidly moderating. The fishing fleet is behind us, and land is just a few miles to windward. In another hour I go forward. The yankee partially trails over the side. Six hanks have been torn loose from the headstay, broken in half by the force of the sea. The sail is torn from leech to luff in two spots, and there are a half-dozen other rips. Two of our stout lifeline stanchions are bent at right angles from the sail and sea pressure. It is not a pretty sight.

I have no one to blame but myself. With just 5 minutes of preventive work on the bow when I first changed headsails all this would not have happened.

There is no place for complacency on a boat. The sea is unforgiving and must never be underestimated.

In leaving a sail lashed on deck with the possibility of weather making up, I have broken a fundamental tenet of seamanship. A good seaman always assumes the worst and prepares as if it is about to overtake him. The situation in which I find myself should never have occurred. When I dropped the yankee, I should have removed it from the headstay and stowed it. I have been lulled into complacency by the seakeeping ability of our boat, and I have underrated the weather.

How the Pros Do It

We want to now begin to introduce you to a series of professional sailors, the very best in the world. These are men at the top of the game, who run and/or deliver some of the largest yachts afloat.

They have all earned their positions the hard way, with an aggregate of several millions sea miles among them. You will find their comments spread throughout the book from here on.Their direct quotations are in a different type font, to make it easy to discern who is speaking.

These folks are all extremely busy and we owe them a debt of gratitude for sharing their hard-won wisdom with us.

Thomas Perry

Thomas Perry is the quintessential professional sailor. With well over 200,000 miles of offshore experience, he has sailed everything from dinghies to "J" class yachts. Names like *Windigo*, *Sea of Oz*, *Parlay*, *Stormy Weather*, *Mariette*, *Endeavour*, *Aello*, and now *Shamrock* grace his resume. With over 30 years of sailing throughout the world, his thoughts on seamanship are worth considering as they span a gamut of sizes and types—from high tech and modern to gaff schooners.

Before taking up professional sailing Thomas was a commercial fisherman for 13 years. He has a bachelor of science degree in atmospheric science and meteorology. We'll let him pick up the comments from here:

Thomas Perry on weather analysis and forecasting:

"I do my own forecasting. I gather information from a few sources: SSB, fax, weather routers, Inmarsat, and most importantly voice broadcasts. Meteo France is very good. Also very helpful are the ham operators such as Herb Hilgenberg on *Southbound II* (I listen in but do not ask for advice). It's helpful to listen to what conditions others are experiencing in your area and outside.

"Each situation is different mostly due to wind direction and the boat's heading, and where land is, especially when it starts to blow over 35-40 knots and building, with growing seas. The most important thing is anticipating the decisions you have to make before it has gotten to storm or gale conditions."

Getting Ready to Head to Sea

A yacht that I am captain of is usually always ready to go to sea. I go through a check list of specifics that I check and double check. I start at the top of the rig and go to the bottom of the keel, safety and survival gear first, all sails to be used, rigging checked thoroughly, deck hardware, sheets and halyards, winches, all mechanical systems, running gear, bilge pumps/back ups, fuel, spares, etc.

Most importantly I assess each crewmember and determine if they are suited to go to sea for the period of time the passage will reasonably take. As well, I take into account if we end up in a life raft, how each individual will handle a survival situation. If I have any doubts I will not take that crewmember. Better to hurt someone's feelings than potentially put the crew and vessel in jeopardy.

Depending on the length of passage and number of crew, I usually set up for short trips with minimum crew a split watch system; six hours on, six hours off during the day and four on, four off at night. With lots of crew I use the Swedish watch system, four on and eight off. Other trips I've used a rotating system where on a two-hour watch you come on deck at the middle of a man's two hour watch, then after your first hour, the guy you've been on with goes down and another crew comes up. I call it an overlapping rotating system. I always put on a senior crewmember as watch leader. They are instructed to call me on deck whenever in doubt and when

Help

within three miles of any vessel as well as whenever there is a sail change.

All crewmembers are instructed in fire plans, man overboard drill and abandon ship procedures, as well. Especially particular to sailing yachts, the proper way to use winches, respect for loads, what to look out for, what not to hold on to(i.e. running back stays), and all crew are issued written sailing procedures covering sail hoisting and lowering, tacking and jibing.

Safety First

On big boats I have found that it is very important to get the boat to go slow enough to be safe in the present sea and wind. I am particularly conservative. I have found that the weakest gear when it is really stormy is the crew. My rule of thumb is “when in doubt reef!”

In general, safety first; never put yourself or anyone else in a situation that they are improperly experienced or unprepared for. Anticipation of problems and making decisions to solve those problems before they occur is the key. Always expect the worst.

I have found that assessing the possible problems and working through solutions when it is calm really helps correct a situation that could be dangerous in storm conditions. By doing this one has already worked out the proper course of action without the pressure of a storm or having to make a decision. When forced to make a decision without forethought it’s 50/50 that you will make the right one and more often than not you make the wrong one.

Advice for Those Just Starting Out

Nothing makes up for experience, but people who are starting out, i.e., deckhands with limited experience, cruisers etc. should learn or acknowledge what they do know. This will point out blatantly how much they don’t know. When sailing with new deckhands I teach them self-reliance and when doing a job, i.e., reefing a main, changing a headsail, having to go to the top of the rig, all during a storm, it’s much better to take the time to do the job properly no matter how uncomfortable than having to do it twice. Seems simple but many don’t do it. Priorities to learn should begin with the boat. Learn as much as you can about every piece of gear aboard the boat. Learn about wind, weather and tide. Know general global circulation patterns, seasonal weather conditions and anomalies. I feel that people should learn as much as they can to make themselves comfortable and confident in less-than-perfect conditions. Skills start with planning and preparation, knowing how to repair most every piece of gear on your boat with the tools at hand (having the ability to make repairs or make something work without the proper parts or tools). This skill I learned when I was a commercial fisherman. Knots are very important. Having a good strong sailing background will give confidence to those without so much offshore experience.

On ground tackle:

“I use a rule of thumb for anchor size, 2 lbs / foot LOA as a *minimum*. I use two anchors occasionally for extra holding power or to reduce swing. Usually approximation of other boats, wind and tide, depth of water are the big considerations. The French are notorious for anchoring too close. If someone anchors too close and does damage I charge them for the repair, no matter how small. Local authorities are usually helpful if it comes to that (although it never has with me). Putting to sea in a gale or deteriorating weather can usually be worse than riding it out in an anchorage. If necessary I take many things into consideration: number of crew, passengers or owner’s wishes, wind direction, sea state, local geography, ability to retrieve the anchor, time of day, etc.“

This lovely ketch is racing at Antigua Classic Week. Not only is racing fun, but it provides the fastest means of learning how to get the best from your boat.

Boat Handling

Most of us started out somewhat intimidated by the boats we sail. I know this has always been true for Linda and me. Size is a relative thing and if you are starting out on a 35-foot (10.6-meter) yacht the boat handling may be daunting, but then quickly becomes second nature. The same holds true as you move up (or down) the size ladder.

Fortunately, the principles between yachts of differing size remain the same. So, once you have mastered a dinghy for example, what you have learned there will stand you in good stead on a moderate-sized ocean cruiser.

Needless to say, the way towards proficiency is *practice*—under sail and power in a variety of light-medium-and heavy-air conditions.

Shortening the Learning Curve

It is easy for us to talk about practice, but for most folks getting ready to go on a cruise and/or leading the normal hectic land-bound life, there is little time left over for practicing their seamanship.

The issue here is priorities and how you spend your time. There is rarely enough time to do everything. So what do you do?

Help

The fastest way to learn how to make your boat go fast is to take her racing. Even if it is a cruising race, towing dinghies (as seen above) having another boat sailing alongside is not only fun, but quickly teaches the best sail trim and pointing angles.

Our view is that before a lot of energy is spent on upgrading the boat, one should concentrate on refining boat-handling skills.

When you get to the point where you are confident in your abilities you will feel much better about your passages. Knowing instinctively how to get the best out of your boat in a given situation generates a feeling of pleasure that is hard to describe, but is nevertheless very real.

And the ideas you have about upgrading the basic boat will have more time to mature as you work on your sailing skills.

So, how do you make the learning process as efficient and painless as possible? The first suggestion we have is to acquire a small sailing dinghy. Small boats are more responsive and you will quickly find the right and wrong ways of doing things.

The next step is to get into racing. It doesn't have to be serious competition. But racing alongside another boat will teach you more about sail trim than anything else you can do. Start with your sailing dink, and then graduate to your keel boat (perhaps racing in PHRF or CHS handicap fleets). The objective here isn't to win (although that is nice) but to learn about making the boat go, as well as improving your boat handling skills.

One summer's worth of racing will teach you more about getting the most from your boat than ten years of cruising.

Before we move on I'd like to pass on something I learned from Mike Parker, a glider instructor (and former dinghy sailor). When I was first learning to soar Mike said that the best pilots are constantly evaluating their skill level. They critique every takeoff, turn, and landing. They are always trying to do a little better, and are never content with their skill level.

I think this makes a lot of sense for sailors as well.

SPEED

A lot of cruisers think that speed is something for racers, but is not necessary or warranted on a cruising yacht.

However, that is actually the opposite of the real world situation. Speed is one of the ways you reduce your exposure to weather variables. It is

Help

The key to fast passaging is keeping the boat moving. That may sound like self-evident advice, but few cruisers follow it.

In the name of conservatism and seamanship, smaller and heavier sails are carried, the sail area is reduced at night, and anything remotely resembling a squall is cause for anxiety.

This is not the way it should be. By sailing a little more aggressively, and paying a bit of attention to sail selection and trim. the average cruiser can cut his passage time by 15-to 30-percent.

also typically more comfortable in an overall context to make a fast passage. And, of course, fast is fun.

Too often, new cruisers are misled into associating performance with unseamanlike practices. Talking to cruisers with thousands of miles under their keels, in anchorages all over the world, we've realized time and again that the performance reported hasn't come up to the *potential* of the yachts they are sailing.

Current vs. Boat Speed

Before GPS, more yachts were lost due to being set off course by current than any other factor. The length of time current has to act on your boat, obviously, is related to the time spent in it. A fast boat is going to be less affected, and that may be the difference between clearing a reef and being set onto it.

Weather Avoidance

Generally, a quick passage means reduced wear and tear on the boat, less exposure to bad weather, and a happy first mate. In many cruising areas, speed is extremely important when considered in relation to weather systems.

Leaving New Zealand, for example, the trick is to wait for a big high-pressure system over the Australian end of the Tasman Sea, then go like blazes the 400 miles north necessary to get past the track of the worst depressions before the next one comes along.

You can normally count on three days of good weather. The fourth day you may be slugging into 60 knots of cold wind. The same holds true for rounding the South African coast from Durban to Cape Town: Wait for good weather and then run like the devil. Speed is essential.

When cruising in areas with difficult landfalls you're going to want to make the anchorage with proper visibility. Many times an extra knot of boat speed makes the difference between a quiet, safe night and one spent hove to off an unlit, dangerous coast.

Even a difference as small as a lack of five or ten miles, accumulated over a long passage, can mean another night at sea.

Speed/Length Ratios

As a rule of thumb, a speed of 1.05 to 1.1 times the square root of your waterline length (this is your speed/length ratio or SLR) should be easy to hit. Yet very few cruisers maintain these sorts of averages.

How do you get up to speed? First, you have to learn what the boat will take, how fast she should be going, and how hard she can be driven. In effect, you must *raise your anxiety threshold*, the point at which your concern for the vessel outweighs other factors.

It bears repeating that the best possible way to do this is to go racing. When somebody in a similar vessel is pounding alongside you and your genoa is improperly trimmed, you'll know it soon enough. If you don't have the gear, or don't want to take your home through all that work, go racing with someone else. There's simply no better way to learn how to make a boat go.

A majority of people cruising offshore today have beautifully equipped boats. They are, on the average, much stronger and more seaworthy than those that have gone before. Aluminum or carbon fiber spars, Dacron or high modulus fabric sails, roller-furling, and self steering have made cruising easier and safer—and should also make it faster.

Performance-Affecting Factors

There are eight major categories of factors which have a large impact on your boat speed as well as your comfort at sea. Fortunately, these are all areas where you can adjust or modify your vessel without too much difficulty (or cost) to improve your passages.

Cruising Displacement

Your displacement (all-up weight) and how the variable part of that weight (your payload) is carried is the first issue.

Weight which adds to your stability, in other words which is carried below the vertical center of gravity (typically below the waterline), enhances boat speed and reduces heel angle. The more centralized the weight, the less tendency there will be to hobby horse going to weather.

In general, most people have too much junk on their boats (ourselves included). This extra, rarely- (or never-) used material takes valuable storage space that could be better used for some of the materials stored high in lockers or on deck. So, scrutinize what's under those bunks and settees, and if you don't really need it, set it ashore!

Sail Inventory

The next variable is your sail inventory. Having the right sail for the conditions, with the correct air foil shape is of enormous importance. This affects both comfort and boat speed. Sails which are too full, and/or have hooked trailing edges are not only slow, but they produce lots of drag. And *it is drag that slows you down and heels you over.*

The entire subject of sail inventory is beyond the scope of this book, but you will find 64 pages and 133 photos on the subject in *Offshore Cruising Encyclopedia.*

Bottom condition is critical to boat speed and safety—especially if you are trying to beat off a lee shore.

The two images below show two levels of dirty bottom. Above is what a lot of folks would call a pretty clean bottom. But those patches of short grass and/or algae will reduce speed upwind by at least 10-percent, maybe more.

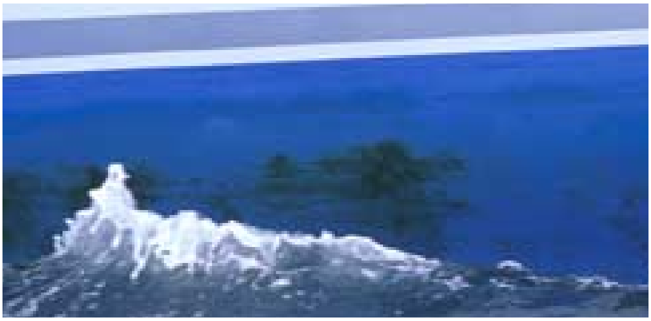
The lower photo shows a really messy bottom. This boat is giving away 20-percent, maybe more, in performance. It will be especially hard on upwind performance.

Underwater Condition

The condition of your hull, keel, rudder, and propeller have a huge impact on how many miles a day you can put on the log.

A thin coating of slime will cut light air speeds by two- to five-percent. Add in some grass, and speed will drop 10-percent or more.

The propeller is particularly sensitive. Even a light coating of scale will reduce propeller efficiency by 20-percent or more. A 1/8-inch (3-millimeter) coating of scale will knock prop efficiency in half. This reduces boat speed and increases fuel consumption.



van der Wal/Stock Newport

Borlenchi/Stock Newport

Help

We make it a habit to dive down and clean the underwater portions of our yachts before every passage. It takes us a bit of work, and there are times when we really would rather be doing something else. However, the feeling of a boat bogged down by a foul bottom is so onerous that we always make the effort.

Boat Heel

Every yacht has a sweet spot in her heeled hull shape where she is at her best. On modern, light displacement, beamy yachts this is typically somewhere around 18- to 20-degrees. Older, narrower yachts will sail efficiently at greater heel angles. Some will still keep accelerating down to 30-degrees or more.

On the other hand you have to consider crew comfort. The more you heel the more difficult it is to move around the boat, to work, and even just to sit.

Most high performance yachts actually do better when sailed upright. In the photo above, the Airodyne 38, Calvin (a Roger Martin design) sailed by the Neri family, is beating to weather at 7.5 to 8 knots. If she were driven harder, heeled another 5 or 10 degrees, speed would only go up a tenth of a knot or so.

Our feeling is that the heel/comfort issue is exponential. At 12- to 14-degrees you don't even realize you are sailing. At 17- or 18-degrees you know you are sailing but life is pleasant. As heel approaches 22-degrees and up you begin to wonder if there isn't a better way to trim the boat to make life a little easier.

On a tender yacht like our 50-foot *Intermezzo*, if we were slugging our way upwind against tradewind seas (yuck!) we had no choice but to drive the boat hard—which meant heeling 30-degrees. If we shortened down to reduce heel, our progress dropped so much that we might as well heave to until conditions improved (which we sometimes did).

At other times, with different types of yachts, you may be able to slow down (by reducing sails, flattening draft, or opening up sheet leads) yet still make reasonable progress in the right direction.

The best heel angle will vary with sea-state, wind, and a host of other factors. Don't be afraid to experiment. Sometimes slight changes will yield huge benefits in comfort and boat speed.

Weather Helm

An integral part of this discussion is how your vessel develops weather helm with heel. Narrow boats are not as much affected as beamy designs. However, whatever the hull shape, you need to keep heel within the limits that the helmsperson, pilot, or vane, can handle.

While reaction to heel is the overriding cause of weather helm, next in line is sail shape and trim.

Sails which are too full, even jibs at the bow, cause weather helm (and heel). Hooked leeches also create weather helm.

We'll discuss later on how to use sail controls, mast bend, and headstay tension to adjust sail shape. For now keep in mind that the flatter your sails, the less weather helm at any given heel angle you will have to deal with.

Finally, as heel is the most important ingredient in the weather helm equation, the easiest way to reduce weather helm is by reducing sail area, or flatten sails which also depowers the rig. This allows you to sail more upright, which in turn allows the hull to be better balanced.

Steering Control

All of the preceding factors come down in one form or another to steering control. In light airs this is not an issue, but as the breeze begins to build you need to find a combination of sail selection, shape, and trim which allows the yacht to be easily steered. You can fight the helm for short periods, but anything longer quickly takes its toll on crew and equipment.

Keel Load

Before we leave this subject we need to spend a couple of minutes discussing keel loading.

Keels develop lift by a combination of boat speed and angle of attack (generated from leeway). Lift is a function of boat speed squared, so you can see that small changes in boat speed make for huge differences in lift.

The closer to the wind you are sailing, the more important the keel factors become.

Since there is rarely anything you can do about your keel configuration the issue becomes how do you make it work as efficiently as possible? First, as we've already mentioned, a clean hull and fins are critical. Next, the flatter your sails, and the better the trim angle, the less the load on the keel. A keel's effectiveness drops dramatically with heel angle.

Finally, with boat speed being such a big part of the keel efficiency equation, it is sometimes better to pick a course *through* the waves which keeps you moving at a good clip, with minimized pitching (as opposed to one which is direct, but tight on the wind and/or more into the waves).

Wind Shear

You are probably aware that the higher you go off the water, the stronger the wind pressure. This is due to the friction of the water's surface

Notice how the main and jib are allowed to twist off at the top on the Santa Cruz 70 Hotel California Too. Because of wind shear, and the more open apparent wind angle aloft, this twist keeps all of the sail at the correct angle of attack. This reduces heel and weather helm, and it is faster.

retarding the winds down low. As an example, if you have 5.5 knots of wind at deck height, the odds are you'll have almost 9 knots at a height of 60 feet (18 meters).

At the same time the wind is being slowed down, the direction is also being twisted by a combination of friction and the earth's rotational energy.

As a result of these two factors the *apparent* wind which the sails see aloft can be as much as 30-degrees different in angle than what you see closer to the water.

The tricky part of this equation is that wind shear is never constant. It varies with the temperature gradient within the air mass and the sea surface. It varies with wind direction (relative to the earth's rotation) and it even varies with atmospheric pressure.

You will find that the amount of wind shear varies from tack to tack as well.

Deal with this by watching the telltales and/or luffs of the sails and adjusting leech twist to the conditions encountered. The main thing to remember is that rather than have a set sail shape which is always used in a given wind strength and angle, you need to check sail trim with your various indicators, and then adjust accordingly.

Maintaining Performance

Before we go on to sail selection and trim, let's talk just a bit more about maintaining performance.

The key is always picking the right amount of sail for a given set of conditions. Take for instance sailing downhill in the trades.

There's nothing more annoying than an undercanvassed sailboat in a tradewind seaway. When running, you'll want to carry enough sail to steady down and keep the boat from rolling. Even when broad reaching, higher speeds can usually be attained without an undue amount of motion.

On the other hand, under certain sea conditions you may be more comfortable going slowly. One of the interesting things about ocean sailing is that the sea is always showing new combinations of wind and wave. Constant adaptation is necessary to maintain fast, comfortable passages.

For a given set of sea conditions, most boats will have a threshold above which even a slight increase in boat speed will be accompanied by a substantial decrease in comfort.

Aboard *Intermezzo* this threshold was at 185 miles per day. Regardless of what was happening, reaching to running, she could maintain this level (about 7.75 knots average) and still be comfortable. But if her speed was stretched to 190 or 195 miles per day, it became difficult to move about and sleep. With *Intermezzo II* the threshold went up to 235 miles per day, and with *Sundeer* it went to 260 miles a day. *Beowulf* gets up to 310 or so miles a day before we start to pay comfort penalties (nothing like a long waterline for comfort!).

As the sea conditions become rougher, or when beam reaching, a further reduction in speed is necessary to maintain comfort at a reasonable level. With a constant sea condition, however, when the breeze starts to die away you must add sail and boat speed to maintain a reasonably steady ride.

Up in the Lulls, Down in the Puffs

Dinghy and catamaran sailors learn early in their racing careers to head up in the lulls and down in the puffs. As the wind dies down, to maintain boat speed you head up, bringing the apparent wind forward in the process. When the breeze picks up again, head off to gain stability and ground to leeward, so you'll be able to head up in the next lull.

These same tactics apply to many offshore passages. Take our trip across the middle Indian Ocean from Cocos Keeling atoll to Rodrigues Island, 2100 miles to the west.Two days out of Cocos, the mid-Indian Ocean trades hit us with a vengeance, as predicted by the pilot charts. The 35-to 40-knot southeasterly, occasionally shifting to south or east, combined in the early part of the passage with a southern ocean swell to make it wet and uncomfortable aboard.

To cope we adopted the tactic of keeping the wind as far aft as possible

Offshore, going to windward poses different problems. Speed becomes secondary to comfort. Just as with downwind sailing, each boat will find a groove where she has the best combination of boat speed and motion.

As we've already said, there are some vessels that in certain wave shapes must be driven hard to maintain boat speed. Backing off results in going up and down and sideways; uncomfortable without attendant progress. Others can be made to sail upwind comfortably at reduced speeds.

On many passages it is best to heave to and await a change in the weather. If your unfavorable winds are coming to you courtesy of a low pressure system the wind will eventually shift when the depression moves on.

This entire subject of weather tactics and using low pressure systems is covered in detail in *Mariner's Weather Handbook.*

when it was blowing hard to make ourselves more comfortable. By running off an extra 15-degrees we brought the apparent wind from 115- to 130-degrees, allowing the southern swells to hit us on the quarter rather than the beam. The result was a marked improvement in comfort.

A week later the southerly swell had died out and the trades had dropped into the low teens. By heading off initially we were able to head up later on and keep the apparent wind forward where we wanted it in the light stuff.

As the passage progressed, we found that with the breeze constantly shifting in direction and velocity we were sailing a zigzag course either side of the rhumbline, but eventually tending just a bit north. Some 300 miles from Rodrigues, when the wind went into the east and lightened, we came up 20-degrees to the south and were able to keep moving while some of our friends who were on the rhumbline (or Great Circle) were rolling around running dead before the wind.

Our erratic course had cost us less than six miles per day in extra distance sailed, which we more than made up in those last few light-air days.

Tradewind Cycles

The trades are constantly shifting, and not infrequently these shifts will take place on a regular basis between daylight and evening hours. On two passages we made between Cape Town, South Africa and the West Indies, we noticed this diurnal shift once we got into the tropics. Since our course followed the edge of the South Atlantic High, we had the winds almost continually right up our stern. We found that by jibing to starboard in the evenings and back to port each morning we were able to stay *out of phase* with the shifts. This allowed us to carry the true wind at 150-degrees (apparent at 135) while only deviating from our actual course by 15-degrees. It made for a little extra work, but our schedule in mid-Atlantic wasn't that busy.

Closer to Shore

Closer along shore, tacking downwind will pose more work and navigational problems.

On smaller boats, whose ability to sail to windward deteriorates in heavy going, *sea room and the margin of safety become the major concerns*, lest the nearby coast become a dangerous lee shore. This is especially true voyaging east of the Bahamas or rounding Cape Hatteras. If a severe northwester should strike, plenty of sea room may be necessary.

The Vang

The importance of a good boom vang cannot be overemphasized. Reaching and running, except in light airs, the leech of the main should be held as straight as possible. Drive is improved this way, and heeling thrust is limited. At the same time chafe is reduced on the leeward side of the sail.

Trimmed up on a broad reach about as pretty as you can get. Note the moderate amount of twist on the main and mizzen. The vang on the main is keeping the leech under control, and the sail well off the spreaders. Even the asymmetrical spinnaker, being used here at a bit too deep an angle, looks good. Now, imagine that warm tradewind caressing your body, think about a swim in clear, warm water once you're at anchor, and taste the sundowner shared with friends in the cockpit as you watch the day end. Anybody for going cruising?

Sail Trim

Optimum sail trim, like so many other topics to do with the sea, is a subject of some debate, and varies widely between different types of yachts. We'll cover the general rules for you here, but to get the most from your yacht you are going to have to match yourself against another vessel, and while they maintain an even level of speed, try different combinations.

Headsails

Headsails are generally easy to trim. What you basically want is an even break or luff from the top to the bottom of the leading edge of the sail. You achieve this by adjusting the fore and aft position of the lead car on the toe rail (or inboard track). If the foot is too tight and the leech (back edge) is loose, so that the top of the sail is twisting off and luffing first, move the traveler car forward (which tightens the leach and eases the foot).

Conversely, if the leech is tight and the top of the sail stays full while the bottom luffs, you need to move the car aft.

In general, as the wind frees (moves aft) the lead car must move forward. In light winds headsail leads will be further aft and when the breeze starts to pick up they will be moved forward.

Two views of a "sled" tuning up for the start of the 1998 Pacific Cup. They are sailing on San Francisco Bay, about 1100, before the sea breeze has started to really fill in and mix the upper layers of air. The result is a lot of wind shear (wind shear is the increase in wind force with height above the water). Increased shear means more twist in the sails is required.

While these sails appear to be twisted off too far, they are actually perfectly set for the conditions.

Help

Mainsail

Mainsail trim is very much a function of rig proportions and the influence of the jib on the main.

The larger the main and the smaller the headsail, the more the mainsail's luff indicators can be used. But as the headsail size (and overlap) increases relative to mainsail area, it begins to backwind the main. In this case you start to need to have some leech telltales (see below) to guide you on your way.

In general, I think it is safe to say that with most mainsails, when in doubt, let it out. You are almost always better off being a little undertrimmed rather than trimmed too tight.

How can it get any better than this? The massive ketch Thendara, broad reaching at Antigua Classic Week, everything set and drawing to perfection. Even the sail twist in the gaffs looks great. And on this point of sail it would be hard to get a more efficient rig than what she is flying.

White Hawk looks pretty good, too. She is reefed down in the main and mizzen to keep her on her feet, using the full yankee jib.

Note the luff shape of the jib. This sail is cut more for reaching (or it has stretched with age) and so it is too full for efficient sailing to weather. The high clew of the yankee also makes the sail less efficient upwind.

This sail is really designed to be used in conjunction with a staysail, flown underneath it.

Using Telltales

When I was a youngster, in the days when Egyptian cotton was high-tech sail cloth, my dad taught me to trim a sail by easing it off until it luffed, and then trimming it back a hair. Considering the displacement and winch power of the typical cruiser/racer of the 1950s this was a daunting task.

By the end of the 50s we were using Dacron, starting to see more powerful winches and had access to a reprint of Manfred Curry's book *Yacht Racing* which had some fascinating wind-tunnel photos. Those photos showed streamers all over the test wings and sails.

One day in 1959 I was discussing a new mainsail for my 17-foot (5.2-meter) catamaran with Swede Johnson, a legendary Newport Beach, California, sailmaker. Swede and I were poring over the Curry photos and discussing the shape of my new sail and the problems we were having in trimming with full battens since the battened sail didn't show a luff when eased.

Swede suggested tying pieces of yarn all over the sail as stall indicators just like Curry had used in his wind tunnel experiments. Such a simple idea, but revolutionary in 1959.

Well, today, as you all know, Swede's telltales are seen on the headsails and mainsails of every racing boat afloat. It is simply impossible to sail in a competitive manner without them. What's surprising is that they're rarely seen on cruising yachts. With fewer hands and perhaps smaller winches these reliable indicators of sail trim are even more important.

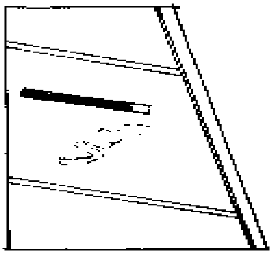
What these telltales do is let you know very early, before any indication of luffing, is that sail trim is right or wrong. They'll help you with positioning the jibsheet lead car and with setting the correct amount of twist in jib and main.

Setting Up the Jib

Okay, let's get a jib spread out on the dock and go to work. You have a choice in telltale materials. Most sailmakers use 1/2 ounce spinnaker cloth, cut into 1/2-inch (12-millimeter) wide strips, about 12-inches (300-millimeters) long. You can probably pick up some scraps at a local loft (look for red and green cloth for the port and starboard side of the sail). Edges should be cut with a "hot knife" to seal them and prevent unraveling. Sailcloth telltales are fastened using insignia cloth which has adhesive on one side. You'll probably have some of this in your ditty bag. If not, pick up some scraps at the loft. Cut out a bunch of 2-inch (50-millimeter) diameter circles. Or, you can buy kits with pre-cut telltales and adhesive dots of cloth in most marine stores. A slot is cut into the middle of the dot, through which the telltale is inserted.

We like to have four horizontal rows of telltales on each headsail. So after laying the luff of the sail on the dock, I'll divide the luff length by five (for a 50-foot/15.33-meter luff that would mean a set every 10 feet/3 meters).

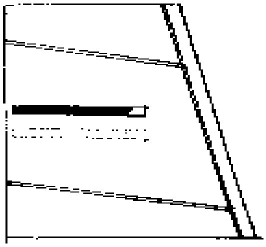
Since it is difficult to predict how far back the optimum position is from the luff, put several telltales in a row. I usually start at 5-percent of the luff to leech dimension aft of the luff and place three or four telltales 3- to 5-percent of the way aft of each other. Avoid seam areas as the telltales tend to hang up on the stitching.



Here is a drawing of using telltales. The top view has the windward telltale streaming aft and the leeward telltale nervous or jumping forward. This indicates the sail is over-trimmed and the sheet needs to be eased.

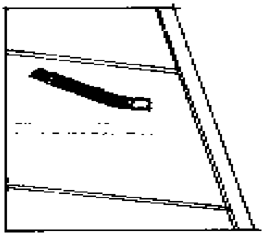
Sailing to Jib Telltales

Now let's see how these work for sail trim. The principle is quite simple. Under optimum trim the windward telltales should be jumping about nervously, while the ones to leeward should be streaming aft. If the leeward telltales are jumping or streaming forward you need to *ease* the sail or head closer to the wind. If the windward telltales are standing straight up or heading forward you have to tighten your sheet or head away from the wind until they go back to their nervous condition.



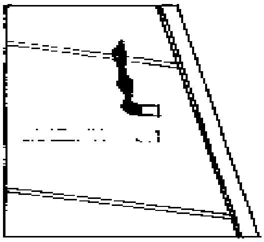
The second drawing has both sides streaming aft—just about right.

Not all the telltales in each row will break at the same time. By experience you'll find a forward one which breaks earliest to use as an early warning and one somewhere towards the middle which will be the best overall indicator.



A touch of easing the sheet so the windward telltale was nervous, as in the third drawing, would be a little faster.

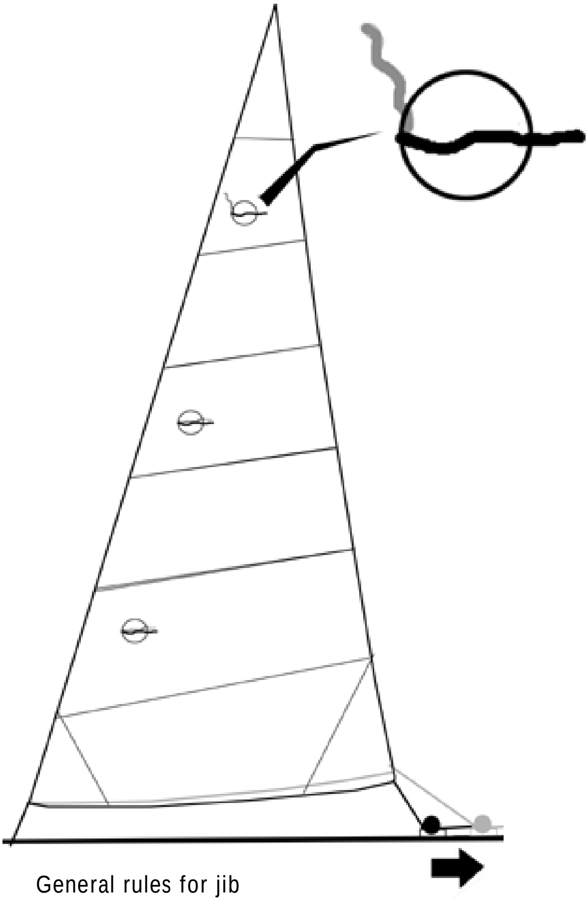
Ideally, all the rows, top to bottom, will show the same action. If not, the jib sheet lead needs to be adjusted forward or aft. The upper rows are the best indicator for lead. If they stall on the leeward side ahead of the bottom rows it means you need more twist in the sail. Move your lead block aft allowing the jib top to twist off, until the upper telltales show the same flow as the lowers. On the other hand, if the windward telltales at the top are stalled (blowing up or forward), move the lead block towards the bow to reduce twist.



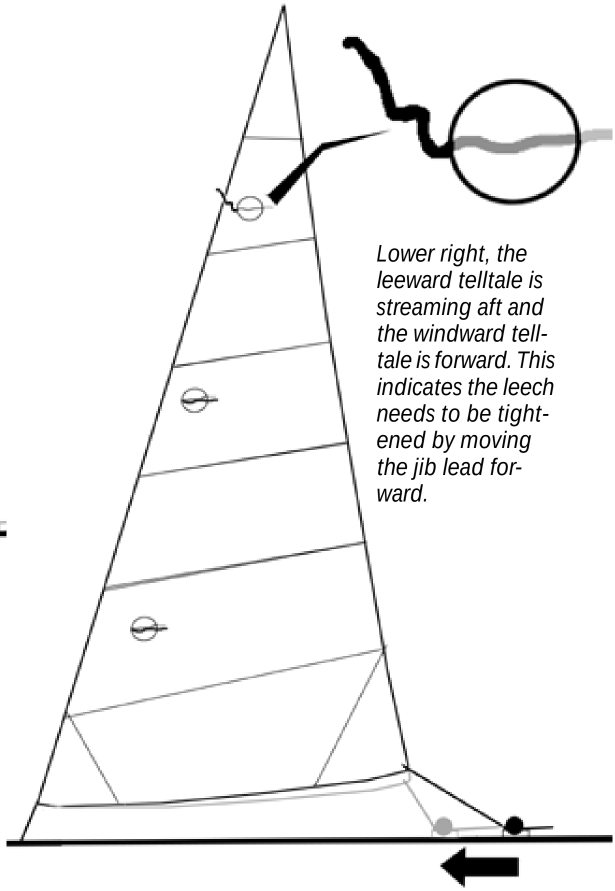
In the fourth drawing the windward telltale is really jumping, even blowing forward. This shows the sail needs to be trimmed in until the telltale becomes nervous again.

After a little practice you'll find one indicator you use 90-percent of the time. It will probably be in the second or third row up, about half way back in the row. Once this telltale is identified consider having a window sewn into the sail so you can easily see its leeward mate.

A second consideration is which is the best telltale to view from the cockpit or under the dodger. After awhile you will find a position which gives you a generally good (albeit not perfect) indicator down lower. If the pointy end is wet, this lower telltale will get a lot of use.



If the jib sheet lead is in the correct fore and aft position, and the sheet is correctly trimmed, all of the luff telltales will be streaming the same way. However, if the lead needs to be adjusted the telltales will show different indications. In the upper left-hand sketch the upper leeward telltale is streaming forward, while the middle and lower are streaming aft. This indicates the top is stalled. To correct this situation ease the traveler car aft, freeing the leech, which allows more twist.



Lower right, the leeward telltale is streaming aft and the windward telltale is forward. This indicates the leech needs to be tightened by moving the jib lead forward.

General rules for jib trim:

- ❑ As the sheet is eased (sailing further off the wind) the lead goes forward.
- ❑ When the sheet is trimmed (sailing closer to the wind) the lead moves aft.
- ❑ In light airs the sheet is more aft.
- ❑ In moderate breezes move the lead forward.
- ❑ As the boat becomes overpowered, ease the lead aft to twist off the head of the sail.

Mainsail Telltales

Because of mast turbulence telltales don't work as well on the luff of the mainsail (unless your mast is of modest size relative to the width of the sail). Here we use telltales on the back end of the sail. These are usually 2-inch (50 millimeter) wide strips of spinnaker cloth, about a foot (300 millimeter) long. Placing one at each batten pocket works well.

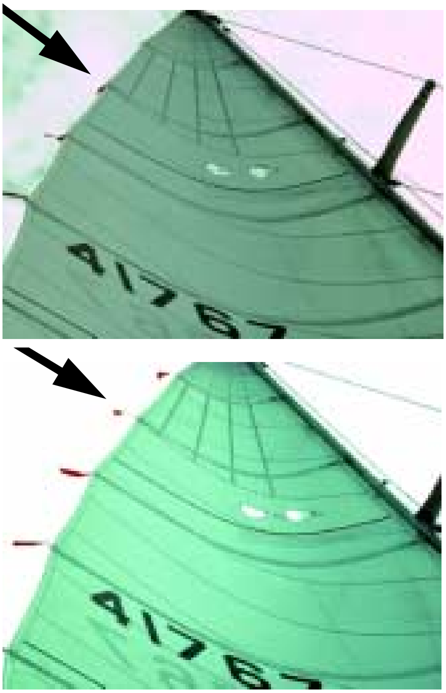
John Conser, former owner of Windward Sails in Newport Beach, California has a simple paradigm for using leech tales. "Trim the sail to the telltale."

Help

If the telltale streams to leeward ease the sail off (toward it). If it streams to windward, trim the sail (again, toward the telltale).

For mainsail twist to be right, all the telltales should stream evenly. If the upper indicators are to leeward ease the sheet or vang to allow more twist.

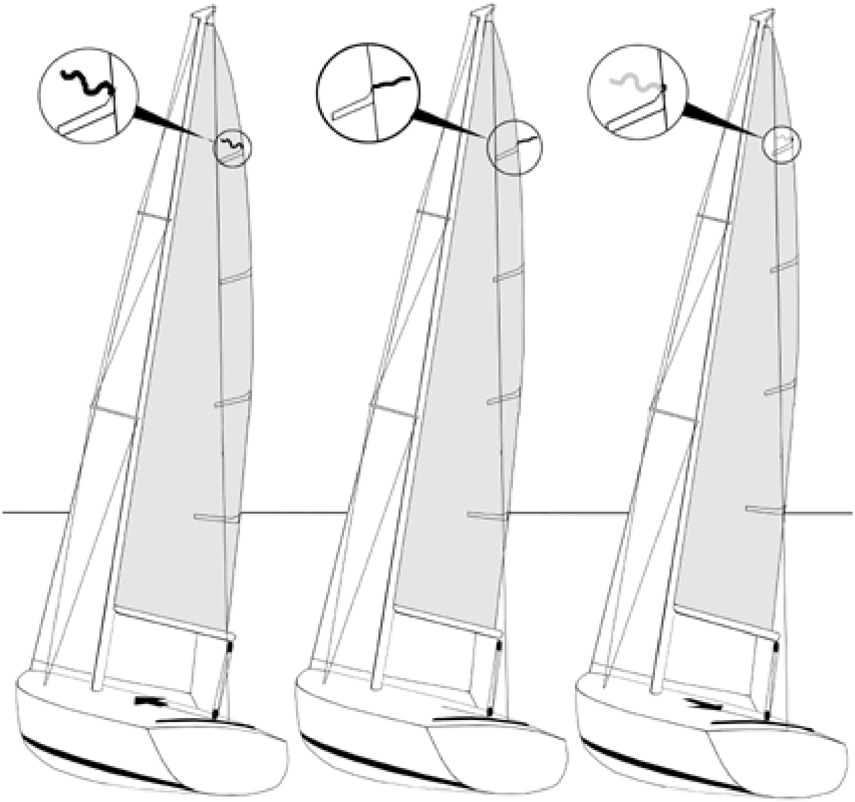
In lighter airs, and when broad reaching, the upper telltale may be difficult to use due to mast turbulence and tip bleed. If this happens, ignore it. In fact, as a general rule, in a four-batten sail the second batten from the top will be your most reliable overall indicator.



Check the top leech telltales in the left photo (arrow). They're not streaming aft which indicates the sail is over-trimmed.

Easing these, as in the lower photo, gets them flying aft again, which indicates proper trim.

If these were flopping forward on the windward side of the sail they would be telling you to ease the sheet.



Here's another look at trimming the mainsail by leech telltales. In the left sketch the telltale is flowing forward on the windward side of the sail. This indicates the sail needs to be trimmed by either tightening the sheet or bringing the traveler to windward.

The middle drawing has the telltale streaming aft—just what you want to see.

The right-hand sketch has the telltale streaming forward on the leeward side, indicating the top of the sail is stalled. Ease the sheet or traveler until this telltale is streaming aft. Note that once you begin to broad reach aerodynamic interference from the mast usually makes it impossible to get the top telltale streaming aft.

Help

Spinnaker Indicators

A final use for telltales is on the spinnaker or whisker pole. Try placing a couple of 2-foot (600-millimeter) streamers either side of center on the pole. These will help you eyeball pole to apparent wind angle. When you find a particular combination of pole angle and sheet trim that works well it will be much easier to duplicate later.

With a couple of dollars worth of material and a few hours of work you can have telltales on the main and jib. Your sail trim will improve and passages will be quicker and more pleasant. What are you waiting for?

Controlling Sail Shape

Throughout the previous sections we've mentioned several times the need to have flat sails upwind and/or when the breeze is up and by corollary, sail with fuller shapes off the wind and in lighter airs.

You can achieve this by changing the sail being used. But it is usually easier to adjust shape with mast bend, headstay tension, as well as adjustments with luff tensions and outhaul.

All of these techniques have been in use for years and years aboard racing boats. They work just as well when you're cruising.

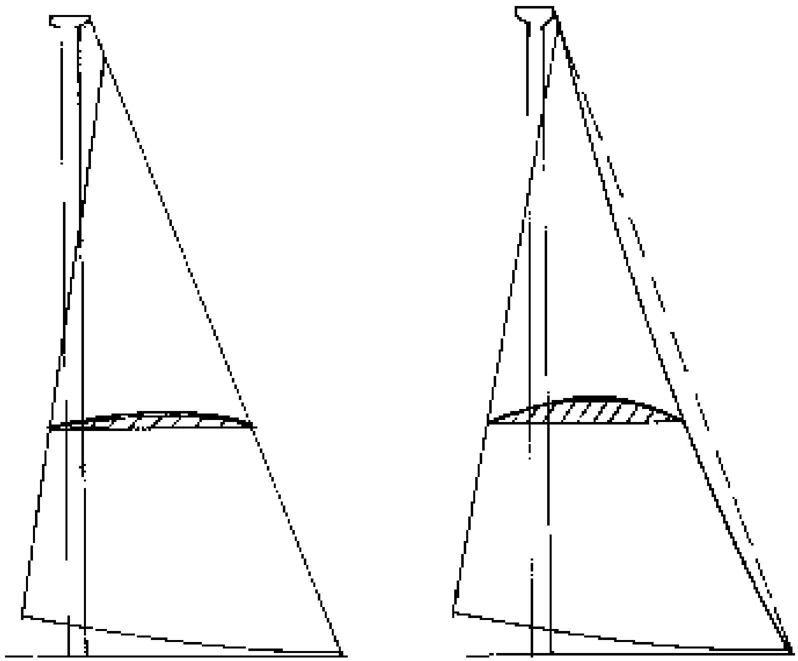
Mainsail

The main is one of the easiest sails to adjust draft with. To begin with, by increasing luff tension you move the point of maximum draft forward (good for sailing upwind) as well as reducing the amount of draft slightly.

Next, by tensioning the outhaul you can reduce draft in the lower third of the sail.

A tight headstay takes draft out of the jib (left) while a slack headstay adds draft (right).

Using an adjustable backstay allows you to optimize headsail shape—fuller in light airs and off the wind, and flatter upwind when the breeze picks up.



Help

Just the opposite occurs when you ease the luff. The draft is increased and the pocket moves aft (both good features for lighter airs and when sailing free). Easing the foot adds draft to the bottom third of the sail.

The biggest gains in mainsail sail shape control, however, come from bending the mast.

By modestly bending the mast forward in the middle, draft is pulled out of the sail. Just a few inches (50 millimeters) of bend can make a huge difference in sail shape. The resulting flatter sail is both faster and more comfortable when the breeze is up.

Headsails

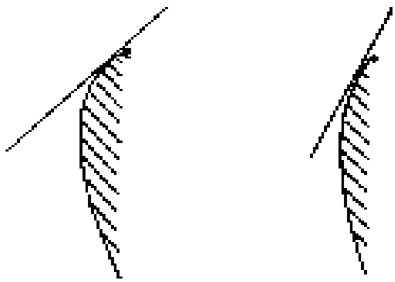
With headsails you have three sail-shaping controls. The first is luff tension, which works on the same principle as the main. Tension the luff to move the pocket forward while increasing the roundness of the leading edge of the sail. Ease the luff to allow the pocket to move aft and flatten the leading edge.

Headstay tension also plays a major role. As the headstay sags under load or from easing the backstay, the headsail picks up draft. As the stay is tensioned straighter draft is reduced.

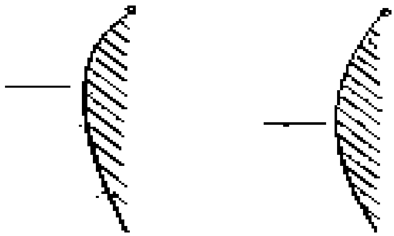
The problem we have to face is that when the breeze is up, and the headstay loads are increasing, the extra load adds sag and makes the jib fuller, exactly when you do not want the extra draft. Conversely, in light airs, with low sail loads, the headstay is tight, making for a flat sail in light airs, again the opposite of what you want.

The only way around this conundrum is to have an adjustable backstay, which you use to adjust headstay tension.

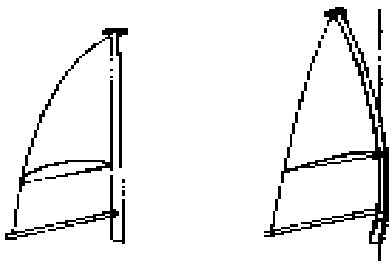
Finally, the outhaul car works somewhat like the outhaul on the mainsail. Move it forward to add draft to the bottom third of the sail. Let it run aft to flatten the lower part of the sail (and open the upper section of the leech).



Foot tension on the mainsail controls the draft in the bottom third of the sail (upper two drawings). When the foot is eased (left) the sail is fuller and the point of maximum draft moves aft. When the foot is tightened (right) draft moves forward and is reduced.



Halyard tension works in a similar fashion. Tighten the halyard (left) and the draft is reduced slightly and moves forward. Ease the halyard and draft moves aft and is increased (right).



Mast bend, available with many modern yachts, is the best means of controlling mainsail draft. When the spar is straight (left) the sail is much fuller than when it is bent (right).

Help

A big yawl powering her way to windward. She's not sailing as close as a modern, fin keeler, so the jib is eased a hair more than a more modern design. Note the relatively high clew of the genoa, and the twist in both main and headsail.

Sailing Upwind

Going to windward is the toughest angle of sail, both in terms of coaxing the most out of your vessel, and comfort. There's also tradeoff between comfort and speed which is more direct than when sailing at more downwind angles.

The biggest variable is sea state, and how this affects your comfort as well as keel loading.

Sail Selection

On a racing boat sails are optimized with narrow wind ranges and are changed as conditions vary. On a cruising yacht you want much wider use from your working headsail as the odds are the same sail is going to stay on the roller-furler regardless of the conditions.

This being the case, you want to make sure first that the sail being used is within its *structural* wind range. Otherwise, the fabric is likely to be damaged and shape distorted.

It is generally better to be a little under- rather than oversized in sail area. A beating sail should be the flattest in your inventory. If there's a long upwind passage on the schedule, it probably makes sense to drop down a notch in size and go up in weight before you head offshore.

Large overlaps should be avoided for beating unless the air is expected to be light. Once there are a good set of white caps running you will want to use a minimal overlap headsail. It is not only easier to trim, and faster to tack, but it will backwind the mainsail less.

Help

Finally, you need to think about the height of the clew. The ideal sail for beating in *smooth* water is a deck sweeper, where the skirt on the foot seals to the deck inside the lifelines. This provides an endplate making the sail vastly more efficient.

However, there are several problems with deck sweepers. First, offshore they tend to catch water which becomes a structural problem for the sail. Second, the minute you ease off on a reach, the sail is difficult to trim. Finally, you cannot see beneath the sail, a definite negative if you are sailing in crowded waters.

Like everything else with boats you are forced to compromise. The final sail design is going to be based on how you use the sail.

Ideally, you will have a blade (high aspect non-overlapping) sail for long beats and something more all around with a little bit of overlap and higher clew for day sailing and reaching.

However, if you want to have one sail for all around work then you need to decide how important beating performance is relative to reaching, and purchase a sail which fits this criteria.

Headsail Trim While Beating

Trim is a function of sea state and wind pressure. In smooth water and as the wind increases you want a flat sail. As the waves begin to impede your progress and/or the wind drops, a sail with more draft and a fuller, rounder leading edge is desirable.

If you have the option of moving your leads inboard or outboard you will find that the right location has a big impact on pointing angle and speed. In lighter airs you generally want a more inboard lead while as the breeze picks up you will quickly find your lead best suited to the rail.

As long as you are sailing on your lines and not heeling excessively, you will want the jib to luff evenly top to bottom.

As you start to need to depower the jib, by moving the lead aft, the leech will twist open spilling wind out of the head of the sail. You will then be carrying some luff at the top of the sail while the middle and bottom are still pulling.

Trimming the jib while beating:

- ❑ Move leads inboard in light airs.
- ❑ Move leads outboard as the wind picks up.
- ❑ Lead forward to make sail fuller.
- ❑ Lead aft to flatten bottom of sail and twist off head.

Mainsail Control

In lighter airs on yachts with big jibs and small mains it usually pays to hike the traveler car to weather so that the middle of the leech of the sail is on the centerline. This reduces interference from the jib.

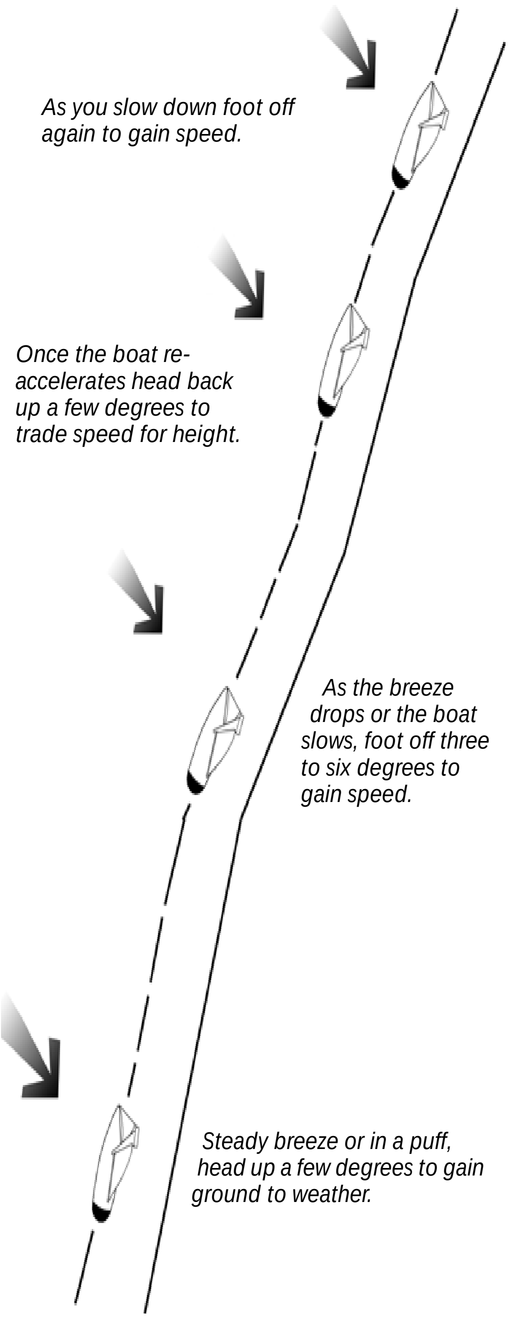
As the breeze increases the traveler will begin to be eased down to leeward.

When you get close to the need to reef you will probably have the main all the way down on the traveler, with the sheet trimmed hard, while the outhaul and luff tension are maximized to reduce draft.

As the mainsail becomes larger and generates more of the total driving force there will be less and less tendency to have the traveler to weather or centered.

Mainsail trim when beating:

- ❑ Bring traveler to centerline in light airs.
- ❑ Ease traveler down as breeze increases.
- ❑ Increase mast bend as breeze increases (to flatten sail and allow tip to twist off).



Sailing an "S" curve often yields a faster speed to windward. Head off a few degrees to accelerate, then come back into the wind to where the jib is just a hair soft. Then, just as speed begins to drop, head back down. Typically you are only sailing plus or minus three to five degrees off the mean course.

Steering Technique

Upwind steering technique has a huge impact on your ability to make progress to weather. If the winds are steady (they never are) and sea state flat (rare) you simply find the "groove"—the point at which you get the best trade off in boat speed and angle—and keep the boat heading at that angle.

In reality, this is a very complex situation. The wind varies in strength and angle constantly, and you have to work your way around waves.

How do you find the best technique for your own boat? The quickest way is to go racing, as we've said earlier. There is absolutely nothing which will teach you how to sail to weather faster.

If racing isn't practical try to find a sister-ship, or at least a boat of similar performance, and then arrange some test sails. Speed testing works for racers and it will work for cruisers too.

If the object is sailing the fastest way to get directly upwind, you will want to point as high as the fins allow with good speed. This means keeping enough boat speed, and thereby waterflow, over the keel/rudder, to keep them lifting effectively. The moment you are going too slow, the foils will start to stall and the boat's leeway will jump. You can usually feel the boat start to "mush" when this occurs.

On some boats it helps to sail an "S" curve. You head down a few degrees to accelerate, then head back into the wind to burn off some of the excess boat speed, climbing higher on the course in the process.

Steering Indicators

Aside from the feel in your hands from the wheel or tiller, and what comes to you through the seat of your pants, there are several visual indicators which work well.

The best are the woollies on the jib. When the sail plan is trimmed up properly, you will find one or two of the headsail telltales that work well as leading indicators. Keep these jumping nervously on the weather side. When they are streaming back hard it means you need to head up. When they are streaming forward or in a stalled condition, head off.

A masthead fly also helps to make sure you are not too far off the wind.

Working the Wind Shifts

The wind is constantly varying in both direction and velocity. In general, head up in the puffs to feather the boat, keeping her upright and gaining ground to weather. In the lulls sail a little softer course, more off the wind to help accelerate the boat.

You will find that there is almost always a pattern to the wind shifts on any given day. Once you find the pattern, staying in phase—tacking on the headers—really helps progress to weather.

The trick is knowing if the wind shift is going to remain long enough to make the hassle of tacking worthwhile. Only practice will tell you this.

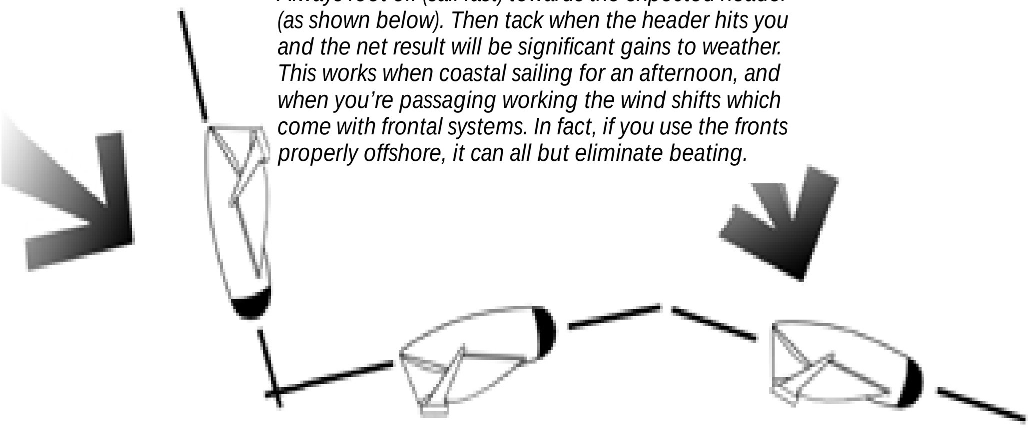
If you are sailing in frontal weather, or along a coast where there are major shifts due to the topography, huge gains can be had by paying attention. In general, always be on the tack which takes you the closest to the expected heading windshift.

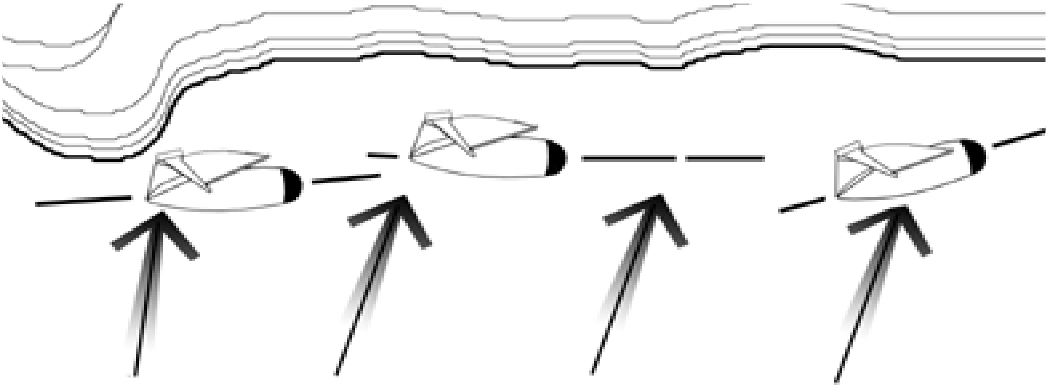
As an example, say you are sailing in a fresh southwester, and your destination is west. If you expect a cold front to pass, bringing a northwesterly shift, then stay on port tack initially. This will take you to the west-northwest, gaining ground to windward and towards the northeasterly windshift. When the front passes, and the wind shifts to the northwest, you tack over onto starboard and head right for the mark.

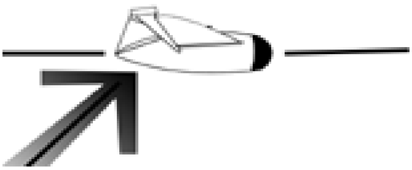
Sailing to Target Boat Speed

One of the problems even the best helmsmen have is distinguishing between a hard beat and a close reach. If you fall off a few degrees the boat feels so much better, but if your objective is dead upwind, the faster speed may be lost to extra distance.

Always foot off (sail fast) towards the expected header (as shown below). Then tack when the header hits you and the net result will be significant gains to weather. This works when coastal sailing for an afternoon, and when you're passaging working the wind shifts which come with frontal systems. In fact, if you use the fronts properly offshore, it can all but eliminate beating.







Sailing along a coastline, with a sea breeze, you often pick up lifts as you come into shore and at headlands. In the case above, the sea breeze offshore is at 45-degrees to the coast, but rotates 15-to 20-degrees back as you close with the coast. There will be a further lift as you approach the headland.

Most racing boats use the concept of target boat speed to help solve this problem. For any given wind strength there is an optimum upwind boat speed. If you sail above this number, you are reaching off too much. Sailing slower means the boat is being pinched. Obviously these numbers for any given boat vary with sea state.

How do you arrive at target numbers? The simplest way is to get a good sailor to go out with you, have him/her find the groove, and then note in your log what the targets are for those conditions. If you are having new sails made ask your sailmaker to help you out. Odds are he/she's a professional sailor and will be able to do this quickly.

Windvane Settings

If a windvane is being used to steer the boat to weather, you'll want to choose a setting which offers a happy medium between boat speed and angle. As the vane cannot work the waves the same way a helmsman does, the bias will be towards footing off to gain speed.

Keep in mind that some windvanes will over-steer upwind and close reaching, working the rudder more than necessary and slowing the boat in the process. Often changing to a smaller wind blade will alleviate this problem.

Using the Autopilot

We have had good luck over the years using our autopilots to control course efficiently when sailing upwind. The steering loads are typically light at this angle, and small corrections on the helm are all that are required. We find it advantageous to keep the remote control close at

Richard Bennett

Beating, large boats are often at a disadvantage in the waves compared to smaller vessels. The smaller boat can work its way around the waves, keeping speed and comfort high. But as you get larger, like the 140 foot (43 meter) schooner Adix shown here. you just simply have to pick an average course and hold on.

hand and vary the course (or apparent wind angle) as required to keep the course optimized.

This gets us most of the benefits of hand steering, without getting wet!

Recently Will Hamm of WH Autopilots has teamed up with Stan Honey to add a "Polar Drive" to his digital pilots. This approach uses a computer with a table of upwind (and downwind) polars. The pilot steers to the target boat speed for any given wind strength. If it cannot achieve this speed, it heads the boat off until it hits a pre-set limit of angle. This is the ultimate way to sail efficiently to windward without getting wet!

Coordinating With Sail Trim

On a racing boat the main and jib trim are constantly being adjusted as the helmsman adjusts course to wind and wave. For cruisers this is a little impractical. In lighter winds you will want to adjust things, but as the breeze comes up it is usually best to pick a happy average trim position.

Helm Balance

The major factor in this trim setting will be weather helm. A certain amount of weather helm is good. It helps the boat feather into the puffs, and makes the rudder an effective lifting surface to help out the keel.

Ideally you will have three to five degrees of weather helm in the average conditions, with a few degrees more in the puffs.

Waiting Out the Weather

On short upwind passages there are often no options but to sheet the sails in and head uphill. However, on ocean passages you can play the weather to minimize upwind sailing. Most of the time you can heave to and wait for a frontal shift, or position yourself on the favorable side of a depression, to avoid headwinds (this subject is covered in detail in our

To ease weather helm:

- ❑ Flatten sails.
- ❑ Ease main down on traveler.
- ❑ Move jib lead outboard and aft.
- ❑ Reduce sail area by reefing.

To increase weather-helm:

- ❑ Make sails fuller.
- ❑ Bring main traveler toward center (or to weather).
- ❑ Bring jib leads inboard and forward.

The way to reduce weather helm varies with many factors. Chief among these is hull shape. The wider the hull for a given length, generally the more sensitive it is to heel, and resulting helm. The photo above shows a moderate-sized schooner, quite boxy in shape, sailing upwind with the main furled.

The opposite extreme is shown below—a Chesapeake Bay log canoe. Long and skinny, with a radical sail plan, there is little change in helm with these hulls.

This and next two pages, photos by Richard Bennett

Mariner's Weather Handbook).

The key is patience. Usually if you wait 12 to 24 hours things will improve and you'll have a much easier time getting to the next port.

Avoiding Waves

Now it gets interesting! Working your way through waves is what separates the good from the really good sailors. In general, you head up in the flat spots, and foot off a few degrees when the waves are larger.

How you attack individual waves depends on boat speed at that moment and wave shape. Usually you head off a bit to help keep up boat speed as you encounter the wave, and then allow the bow to feather into the wind as you break through the crest. This is followed by an immediate change in course back to leeward to get the boat moving again before the next wave comes along.

Short of getting out there and practicing, it is difficult to convey the actual technique for steering a boat quickly and comfortably up hill. But keep in mind that the same thing which works in little waves also applies to big ones, just the finessing is different.

We want to close this chapter with a series of photos showing a variety of yachts beating in different wave situations. While many of these are racing boats, the techniques described work for short-handed cruisers, too!

Working waves upwind requires constant awareness of what the boat is doing at present, and what waves are coming at you in the next few seconds. In the top photo we have a boat driving through the crest of a medium-sized wave. Assuming good speed a few seconds prior, the helmsman will pinch up a few degrees as the wave starts to impact the bow. Then as the boat begins to work its way through the crest (below) the helm is put down and the boat eased off the wind a hair to speed her up (and keep good flow over the keel and rudder).

In the upper photo the boat has broken through the crest and pulled off to leeward. Speed is increased. At this point begin to bring the boat back higher on the wind until speed starts to drop to the optimum level for beating (target boat speed if you are sailing to polars).

Below shows a similar situation. The boat is going fast, footing off after a wave, and is now about to be headed higher to convert some of the footing boat speed into height to windward.

A relative flat spot (above) compared to the majority of the seas on this windy afternoon. Smooth spots like this occur from time to time allowing you to pinch up to weather five degrees or more. Once the bigger seas come back, the boat needs to head back off the wind a few degrees to keep up speed.

The boat in the lower photo has been caught by two waves close together (and it is blowing a gale). They have been slowed down by the sea they've just crossed, and now another wave is about to further slow progress. The only solution is to head off to get speed up and the keel/rudder working again. If you have sufficient crew aboard, the sheets would be eased at the same time the boat is headed off, and then trimmed again as speed is built and the boat headed back onto a close hauled course.

As wind and seas build you will find it necessary to point lower so as to maintain good speed for the keel and rudder. Pinching in these conditions is counterproductive as it leads to stalled fins and excess leeway.

TACKING

Knowing how to get the most from your boat when tacking is not only fun, but can contribute to your safety when you need to sail your way out of a tight spot.

Unfortunately, there are no across-the-board cookbook formulae. Techniques vary widely with sail selection, hull and keel configuration, not to mention sea-state and wind.

What we want to do in the rest of this section is discuss the basics in a theoretical context. The next step is for you to go out and practice tacking back and forth, checking how long it takes you to get back up to speed after each maneuver. You'll find that a little practice goes a long way (and it is a lot of fun once you get to the point where you can snap your boat around).

A cutter stay slows down your tacking procedure as the sail wraps around the wire. It will double or triple the time that is required to complete the tack. In addition, the act of the sail wrapping around the wire causes the sail fabric to break down. On old style "soft" Dacron fabrics, with little or no resin, this was not a big issue. But modern laminated fabrics have a very short life span if forced to slide by a cutter stay.

We always remove our cutter stay before short-tacking.

Hydrodynamic Issues

All of the discussion we've had so far about sailing is to some degree dependent on your keel characteristics.

The lift generated by the keel is a function of the angle of attack created by leeway, and boat speed squared. Since the keel's lift increases with the square of the boat speed you can see that small changes in speed will have huge impacts on keel efficiency and lift.

The keel has to overcome rig forces. The higher these forces, the harder the keel must work. When the keel is overloaded through a combination of too much rig force and too little boat speed it begins to stall. The stall is started by the water flow separating around the leading edge and then creating turbulence as it flows aft.

Once the keel has stalled, you will slow way down and begin to slip sideways.

In smooth water sailing conditions, the keel will keep you moving efficiently to windward (efficiently obviously being a relative term!). The main issue to remember is that the flatter your sails, the lower the keel load. The keel is also sensitive to heel angle. The more upright you sail, the more efficiently the keel works. Keeping sails flat reduces heel angle as well as keel loading, a double advantage.

Along with flattening the sails, another way to reduce keel loading and overall rig drag is to ease the sheets a hair. Once the breeze is up, it is usually better to ease the main down a few feet on its traveler, keeping the leech tight (as opposed to keeping the traveler towards center with a heavily twisted leech).

The keel sees its highest loading during a tack. As you swing through the eye of the wind, and then fall off on the new course, boat speed has dropped so the keel has to work much harder to generate lift.

It is while beating in general and during a tack in particular that bottom, keel, and rudder condition is so critical. Even a small amount of growth will have a big impact.



Another large issue is prop drag. A high-drag, fixed propeller can easily double the space required to complete a tack.

Working the Sheets

Before each tack take a quick look at the sheets and make sure they are ready to run. The currently loaded sheet should be flaked, so that when cast off it won't catch in the lead car as it runs out.

Next, the lazy sheet (soon to be under load) needs to be given a cursory glance to make sure that it is not caught on the edge of any hatches, around mast hardware, or on deck cleats.

There is a direct relationship between how the headsail is cast off and how much effort must be expended trimming it in on the new tack. If the timing is right, and the overlap of the headsail is moderate, you can trim most of the sail on the new tack before it begins to fill. This means a majority of the sheet can be trimmed by hand, and only the last bit needs to be winched.

Just before tacking take the slack out of the lazy sheet.

In light airs you can reduce the number of sheet wraps on the winch to the point where there are just a couple of turns. Then, as the sail begins to luff to the opposite side the sheet can be quickly cast free.

When loads are higher you will have to feed the first couple of feet (600 millimeter) of sheet into the winch to reduce loads before casting the turns off the winch.

Once the sheet is cast off the new sheet is trimmed as fast as possible. I like to start with one or two wraps on the winch (depending on load) while trimming by hand. The best technique I have found is to use my arms whip fashion, keeping them extended so that I get maximum line travel from each whip sequence.

Smooth tacks are very much a function of timing; how fast you turn into the wind when the jib is cut loose and how quickly it is trimmed back in. With good boat speed you can free the jib as soon as it begins to luff deeply, which gives maximum time to get it sheeted in again on the new tack, before it fills. In lighter airs, or in a sea, it often pays to hold the jib back for a few seconds, to help blow the bow across the eye of the wind. This does make the trimming harder on the new tack.

Genoas with large overlaps are very difficult to tack. There is so much sail past the shrouds that it is impossible to trim it before it fills. With a "blade" (non-overlapping headsail) if the crew is quick enough it can usually be trimmed most of the way by hand. This can pay big dividends when beating in confined areas.

Wait for a relatively calm patch of ocean on which to tack, make sure you have good speed on—it may be necessary to fall off a bit to accelerate before tacking—then fall off the wind a bit after coming through the eye of the wind to build speed again.

After two or three "whips" like this it is time for the winch handle. If the winch is used quickly enough the sail will be sheeted home before it comes under real load as the boat fills away on the new tack.

Tacking Techniques

In smooth water and light to moderate airs we usually wait for a puff to tack into. The added breeze accelerates the boat giving more momentum with which to complete the tack.

On the new tack we usually head down five to seven degrees below the final course to allow the keel to get up to speed without excessive stalling.

Care needs to be taken not to oversheet the jib. It will need to be in an eased position as you start to accelerate. Then as speed picks up and you begin to sail the proper upwind course, the sheet is ground in to trim it for this angle of attack.

Keep in mind that nothing stops a boat faster than oversheeting the jib after a tack!

Since we typically sail on shallow draft boats, where we need to watch keel loading, we will usually slide the main traveler to leeward a hair after initiating the tack which helps to unload the keel. The main is pulled back to its full upwind power position once we've accelerated back up to speed on the new heading.

If you have easily adjustable jib lead cars you may want to start the tack with the new car forward a bit to increase sail draft. Once you are up to speed and on the new heading, the car is then eased back to its normal position, flattening the sail.

In Heavy Airs

In stronger breezes the technique needs to be a little different. Rather than tacking in a puff, wait for a lull. Easing the mainsail well down on the traveler will also help you get the boat accelerated on the new tack before stalling the keel.

Help

In Big Seas

Big seas create the largest problem during a tack. If a large one smacks your bow at the wrong time you lose all way, making it hard to get the bow to blow through the eye of the wind, and then the keel stalls. You may even end up in irons.

The key to this problem is having the boat nicely accelerated and then picking a relatively smooth patch of water for your tack.

When you come around on the new course, head below course 10- to 15-degrees to make sure you get the boat moving before you get stopped by a wave. If you do get smacked, the extra angle (you will really be close reaching at this angle) will help the keel reattach its flow and build back boat speed.

In Irons

If you get stuck in the middle of a tack, where the boat won't coast through to the new course and you start to drift backwards, this is called being in irons.

The more efficient your sail plan, hull, and fins, the less likely this is to happen. However, with longer keels, and inefficient sail plans it does happen, especially in strong winds and/or sloppy sea states.

There are a couple of things you can do to get out of irons. The first is to back the jib, in other words sheet it in to windward. This should blow the bow around on the new tack.

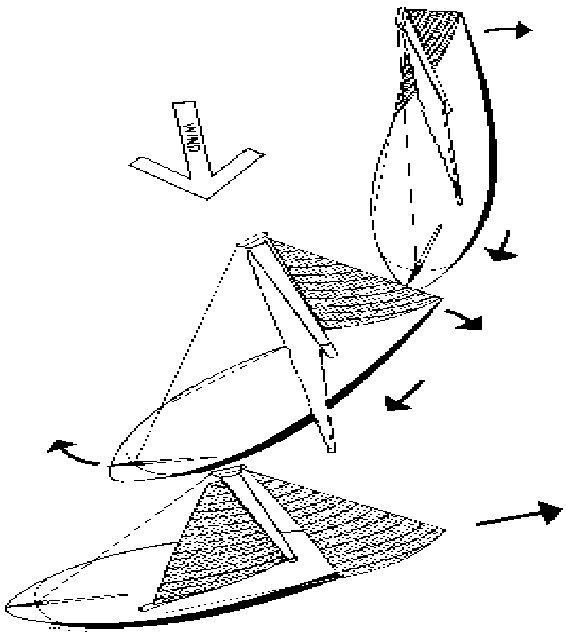
The second thing to do is ease out the mainsail to where there is no load on the sail and it is feathered (and do the same for a mizzen if there is one involved).

Finally, the boat will probably be slipping aft from rig drag. This being the case you need to turn the wheel the opposite direction you want the bow to go. The stern will then swing off into the wind while the bow pays off to leeward. At the point where you start to move forward the helm is then put down to leeward.

The jib is usually released and sheeted in on the new tack when the wind is far enough aft for it to begin to fill.

Tacking check list:

- ❑ Leeward sheet ready to run freely.
- ❑ Running backstays ready to change over.
- ❑ Cutter stay cleared out of the way.
- ❑ Decide if it is necessary to back the jib to help blow the bow around.
- ❑ Ease sheets slightly and accelerate.
- ❑ Tack in an area of smooth water.
- ❑ Fall off past hard on the wind to accelerate.
- ❑ Head up as sails are trimmed and speed builds.



Backing the jib is usually the quickest way out of irons. In many cases, however, you will have to ease the main down on the traveler or ease the sheet to allow the bow to head down far enough off the wind (upper drawing).

If the boat is making sternway, turn the wheel into the wind (or push the tiller to leeward) so the stern goes into the wind and bow falls off. The moment the boat begins to move forward reverse the helm so you head to leeward.

Help

Reaching

Once you bear away a bit from the wind and begin to ease sails, the boat accelerates quickly. Stability is quite critical, sometimes more so than when beating.

It is usually steering control which dominates the decision when to begin to depower the rig by flattening the sail or reducing area.

White Hawk set up for power reaching in just a hair too much wind. She's got reefs in the main and mizzen, but is carrying her mizzen jib. The very high clew on the yankee jib makes the slot between it and the staysail more efficient. But that staysail would work even better if its clew were lower.

Mainsail Trim

Mainsail trim is simplified by the fact that the sail is attached to a boom. As you ease the sheet, the boom keeps the sail in the shape of an efficient air foil.

Optimum trim is determined with the leech telltales. You want the middle telltales to be streaming aft.

In most cases the further off the wind you are sailing, the more draft you will want in the sail. This means easing the halyard and outhaul, and releasing backstay pressure to reduce mast bend.

As the breeze increases, and/or you begin to sail closer to the wind, you will want to flatten the main (tension luff, tighten outhaul, bend the mast).

Many yachts have more of a problem with weather helm when reaching than when beating (when the breeze is up). If this is your situation, you will first want to go through the flattening actions on the sail. Next, you can ease it off a bit on the traveler to depower the sail. The more battens you have (and the longer the battens are) the more you will be able to feather the mainsail in this fashion.

At some point, where heel is uncomfortable, or weather helm is excessive, you will want to think about a reef.

Headsail Selection

With jibs the problem is a little more complicated.The more you ease the jib, the more rounded (fuller) becomes the airfoil shape. This builds lift and drag rapidly.

Another issue is the height of the sail clew. As the sail is eased it becomes more difficult to control twist as well as fullness.

Low-clewed sails which are ideal for beating become excessively full down low while at the same time they twist off at the top too much.

The answer to this condundrum is a high-clewed reaching jib.

The higher clew allows you to trim the sail within a wider wind angle range. Typically a reaching jib will also be cut somewhat fuller than a sail meant for beating, and be of lighter materials since the loads the sail sees once it is eased are much lighter than when trimmed hard on a beat.

If you are going to have a reaching jib made, consider one which will sheet to the end of the main boom at wider angles (as well as to the rail).

Methods of easing weather helm:

- ❏ Flatten mainsail.
- ❏ Tighten head-stay to flatten jib.
- ❏ Ease main travel-er.
- ❏ Ease main sheet to increase twist.
- ❏ Move jib sheet lead aft to in-crease twist at head.
- ❏ Reduce sail area, first in main by reefing, then for-ward by chang-ing headsails or reefing the jib.

Reaching Headsail Trim

Once you begin to sail free trim requirements are not as exacting as they are going to weather. We like to see just the beginning of nervousness in the windward telltales. If telltales are missing, we'll ease the jib until it just starts to get nervous on the luff, and then trim it back a few inches (50 millimeters).

If you are sailing free with a low-clewed sail, or perhaps a sail with a stretched (distorted) leech, you may find it difficult to get the entire sail to pull evenly. When the middle and bottom are nicely trimmed the top may be luffing. You can sometimes correct this by tightening the leech cord, or by moving the jib lead forward. However, be careful not to overdo this. If the middle and bottom have to be overtrimmed to get the top to stop luffing, you may be faster with the top eased.

This will certainly be the case as the breeze increases.

A pretty picture that shows some common mistakes. First, this crew is flying a low-cut genoa on a beam reach. The clew of the sail is optimized for beating, not reaching. As a result the foot is too full and the top too twisted off. The result is less boat speed and more heel.

This big, ill-shaped genoa is clearly trying to overpower the boat. To help keep the boat on her feet, the main has been eased off a bit more than optimum, another hit in the boat speed department. If this boat had a smaller, higher-clewed jib which could be properly trimmed, she would be faster and more comfortable.

One of the most thrilling sights in yachting—a J-boat on a beam reach. Endeavour is carrying her double-head rig which is drawing beautifully.

Note the minimal overlap between the two sails, and the difference in clew height.

When the breeze pipes up with this sort of rig, you can reef the main and stow the outer jib. The boat is then snugged down with a low center of effort, and ready for stronger winds.

Endeavour would probably be faster with a single reaching jib rather than the double-head set-up. But it would clearly be a lot more work to handle.

Twin Headsail Reaching

Any time you are flying a high-clewed reaching jib there exists the possibility of boosting performance with a staysail. Ideally, the staysail will sheet to a set of tracks somewhat inboard from the rail and have a relatively low clew. However, a high-clewed heavy-weather staysail will often give you a boost as well.

The key factor is to make sure that the staysail and reaching jib do not interfere with each other. This means maximum separation.

There will frequently be a conflict between optimum outer jib trim and that which is required for the staysail.

When this is the case, get the outer jib optimized, and then do the best you can with the staysail. This frequently means oversheeting the staysail to the point where many of the telltales will be stalled.

Twin headsail rigs take a lot of fiddling and care. Trim must constantly be attended to, and the benefits are frequently illusory. However, every now and then you get it just right and then boom—the knot meter really starts to climb.

Steering Technique

Steering issues when reaching are much simpler. In relatively smooth water and stable winds, you point the boat on course and enjoy the ride. As the winds back and fill a bit, if you are ambitious, adjust the sheets as required. Otherwise, adjust course (especially if the pilot or vane is steering and it is wet on deck!).

The problem comes when the breeze picks up and the waves begin to knock you around. It then becomes difficult to find a comfortable heading (comfort in this case is usually synonymous with a heading on which the boat is easy to steer).

It is probably going to be necessary to set sail area for the puffs rather than the median wind strength as the puffs tend to create heel and weather helm. This means you are going a lot slower much of the time, but this is often the only way to make the ride comfortable (and ease steering loads).

Wave direction will affect the course chosen. Often there is a heading 15- to 20-degrees higher or lower of the direct course which gets the waves off the beam and more on one end or the other. The key to this puzzle is to experiment with various headings (adjusting sail trim to suit).

Keep in mind that there are some conditions where it may actually be more efficient to add sail area and boat speed, if this helps steering and keeping on course.

Richard Bennett

Finding the "groove" between wave systems gets more difficult as the breeze picks up. You need to foot off towards the relatively smooth spots which are the best for punching through the crests. When periods of smaller seas occur, the boat can be sailed higher and slower. But when the big sets come rolling through, speed must be maintained so there is good steering control and keel load is reduced.

The boat above is sailing upwind in strong gale conditions. She's just come through a chaotic patch and is footing off to gain speed again. Note how far down the main traveler is adjusted. The boat would probably be faster with a smaller headsail or another reef in the main and the boom a little closer to the centerline.

Help

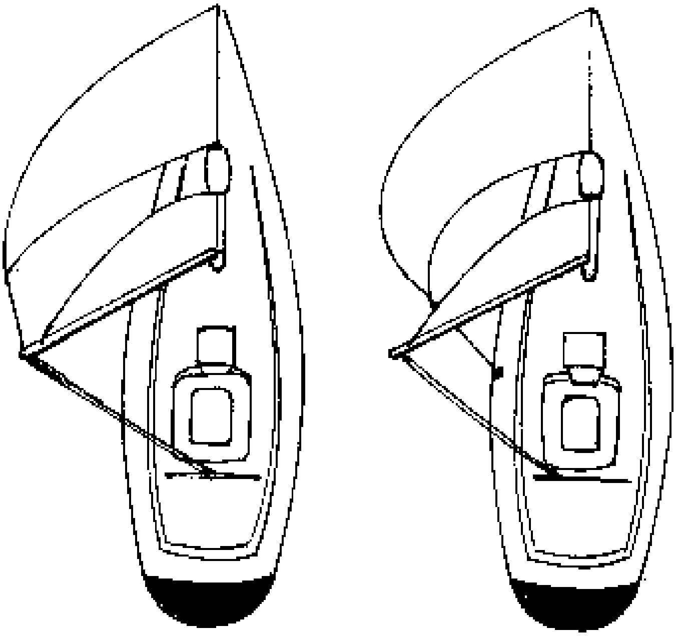
Broad Reaching and Running

As the wind swings aft onto the quarter all sorts of possibilities open up for sail combinations. You can just ease the sails out a bit further (which quickly becomes slow and inefficient) or get a bit more aggressive.

You then have the choice of single jib to weather, twin jibs, or flying a conventional or asymmetric spinnaker.

The decision-making process should involve the following: first, how much speed do you need (or want) to meet your passage objectives? Next, how hard are you willing to work? Third, how stable is the weather likely to be? Fourth, if the weather is unstable, perhaps squally at night, how difficult is it to shorten down with the intended rig?

Finally, you have to evaluate the capabilities of your vessel when pressed hard sailing off the wind. If you have good steering control and lots of stability, you will be able to sail more aggressively. But if your boat is a little tender, and tends to round up when pressed really hard, you may want to stay a jump ahead of the weather.



As headsail sheets are eased there comes a point where the sail curves back towards the boat (right drawing). This cupped shape produces a lot of drag and heel, and is slow and uncomfortable.

If the clew of the headsail is cut high enough, it can be lead through the end of the boom. This eliminates or reduces the cupping, improving steering, speed, and comfort.

Sheeting to the Main Boom

The first step as the breeze goes aft is to look at sheeting through the end of the main boom. This gets rid of some of the belly in the sail, opens the leech of the headsail relative to the mainsail (compared to where it would be if sheeted on the rail), reducing drag, and weather helm in the process.

For end-boom sheeting to work the clew of the jib must be designed relatively high from the beginning for this approach. Low-cut jibs obviously will not work. But if you have a reacher, or yankee, give it a try to see how it looks.

There are several ways to set up your running rigging. The system I like best is to have the boom snugged off with a preventer, and then run the jib sheet through a snatch block on the boom, thence to rail, and then to the cockpit.

With this you will find that there is some chafe under the boom, but this is usually tolerable.

Help

Alternately, you can lead the sheet down and then off the boom at the base of the mast (or to a winch on the boom). With this sort of setup one usually makes a gross adjustment of the jib sheet relative to the mainsail, and then does the fine adjustment with the main sheet (trimming both sails at once in the process).

Boom sheeting the jib is usually too much hassle for short trips. But for a long passage it can significantly enhance your progress.

Single Headsail to Weather

Once the wind gets onto the quarter it becomes possible to get the jib out to weather on the spinnaker or whisker pole. This will usually pay dividends with the apparent wind as far forward as 120-degrees, if the pole is long enough in relationship to the foot length of the jib.

Don't be afraid to ease the pole well forward and have the jib billowing out ahead of and to leeward of the headstay. It looks funny, but is usually more efficient than sailing with the jib to leeward.

You will probably be surprised to find out that smaller jibs frequently are more efficient on the pole than big genoas. This is because they set better than sails with huge overlaps. What provides the drive is not total sail area but projected area. So a sail with a nice tight shape between the headstay and the end of the pole is best.

In sloppy conditions, with the boat rolling around a bit, it

En route between Cape Town and the Virgin Islands and we're carrying a light reacher on the pole to weather, a working jib to leeward, and full mainsail. The true wind angle is 150-degrees, apparent wind is at 135. Twin headstays make setting these two jibs quite easy. Today, however, we would sew a Vectran or Spectra rope into the luff of the reacher and free fly it, making the second headstay unnecessary.

The photo below shows a free flying reacher to leeward with the roller-furling jib set on the pole to weather. In this case the wind is at about 115-degrees apparent, so the pole has been eased forward to keep the weather jib flying.

During the same passage between Cape Town and the West Indies we experimented with two headsails, running dead downwind (photo top of opposite page). If the breeze was strong enough to push at nearly hull speed heading straight downwind worked best. But in lighter winds, carrying the main and jibing against the diurnal wind shifts proved faster and more comfortable.

Two views (above) of the 70 foot (21.5 meter) Sparkman and Stephens motorsailor Win'Son. Jim and Cheryl Schmidt circumnavigated aboard her in the late 70s, mainly without crew. Her spinnaker poles were stored on the mast and in the tradewinds she primarily sailed as shown here.

sometimes pays big comfort and speed dividends to oversheet the poled out jib.

When the wind is forward, and you are close to the edge of what the poled-out jib will stay filled in, easing it a bit extra, so that it wraps around the headstay, will frequently keep it from collapsing.

Sometimes sea state, wind shifts, or the yawing of the boat are such that the jib keeps collapsing to leeward. When this happens it is often faster in the long run to head off a few degrees from the course to keep the jib filled. Then, when you get closer to your destination if the wind has not allowed you to head up with the jib on the pole, you can bring the jib to leeward and reach up.

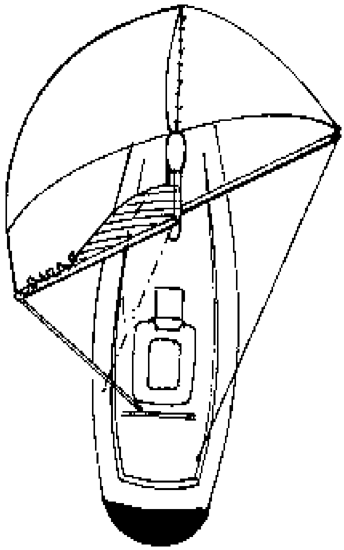
The extra distance you sail is almost always more than made up for by better boat speed, so you arrive quicker, after having had a more comfortable ride.

Twin Headsails Downwind

There is frequently a synergistic effect between two off-the-wind headsails which produces more drive than the total area (a good percentage of which is in the lee of the mainsail) would indicate. The windward sail seems to direct its flow onto the leeward sail.

While handling a spinnaker or whisker pole can seem like a pain it offers you a faster passage and the ability to sail at angles square to the wind. If you delay using the pole and sail without, as the boat above is doing, you are limited to an apparent wind angle no greater than about 150-degrees, or the jib will collapse in the lee of the main. And even when the jib is drawing at that deep an angle, as it is doing here, it is not nearly as effective as if it were in clear air to windward.

When you are running in lighter winds and smooth waters it is usually possible to get the jib to fly to windward without a spinnaker pole. The trick is to steer dead downwind, and quickly adjust course with each wind shift. These folks are winding their way through a very tight Edgartown Harbor on Martha's Vineyard (East Coast of the US).



Often pulling a reef into the mainsail will improve air flow to the leeward jib.

The leeward sail is then more stable and rolling is reduced.

If there is a cross sea present, a scandalized (prematurely reefed) main can be sheeted in more towards the centerline of the boat to help reduce rolling.

Help

A key factor in making twin jibs and the main a fast combination is good separation between the leech of the leeward jib and the leeward side of the mainsail. This photo is taken lying on deck looking up. There is a jib to weather (on a pole) to the right of the photo, and a free-flying reacher to leeward. Note how close the main and reacher are. This chokes off the air flow on both sails. The jib needs to be eased and/or the main trimmed in.

If you don't have a second jib to fly to leeward (or the means to fly one) the odds are you will have a staysail or storm jib aboard. If these are flown to leeward, from the inner forestay, they will add substantially to your downwind performance. Their effect is greater than the small area would indicate as they provide a leading edge slot for the mainsail. As a result they make the main a lot more efficient.

Many roller-furlers have twin luff grooves, so you can add a second sail to leeward. However this makes the use of the roller-furler problematic and in a short-handed context is probably of marginal value.

Free-Flying Headsails

Our favorite approach to using twin headsails off the wind is to have the working jib on the roller-furler to weather and a free-flying reacher or drifter set to leeward.

This free-flying sail can be on a loose roller-furler, or in a sock for ease of use.

The tack is attached as far forward as possible, typically on the end of the anchor roller. The head of the sail is hoisted on the spinnaker halyard.

Ideally it will be sheeted through the end of the main boom, but it is also effective sheeted to the rail.

You can frequently find a used "wind seeker" type of sail or light reaching genoa that can be converted to free flying (by sewing in a Vectran or wire reinforcement into the luff).

This type of sail will do double duty as you can use it for closer wind angles in light airs, yet it can be carried broad reaching and running at very deep angles.

Main Boom Sheeting Angle

As the wind gets square behind you will want to have the mainsail as far out as possible. Keep in mind that the more eased the main sheet, the more stable the boom—it won't want to jibe as much when it is squared away to the wind as when it is sheeted inboard a bit.

When the wind is all the way aft if the main boom is not completely eased there can be a tendency for it to jibe prematurely.

Scandalizing the Mainsail

There are times when wind angle and sea state have you sailing dead downwind (or close thereto). If you have two large headsails set the odds are that the leeward sail is being blanketed by the mainsail.

In this situation it frequently makes sense to pull a reef in the main so that the top of the leeward headsail gets clear air.

The "scandalized" mainsail is usually overtrimmed at this point to help reduce trade wind roll.

Steering at Broad Angles

Steering at deeper angles requires a different approach than sailing closer to the wind. Here the waves are for the most part a help rather than hindrance.

Design Issues

Upwind and reaching hull shape and displacement are not as big a factor as when the wind swings aft. Heavier and/or beamier boats will lose control off the wind more quickly than lighter, narrower boats, so they need to have their sailplans reduced accordingly.

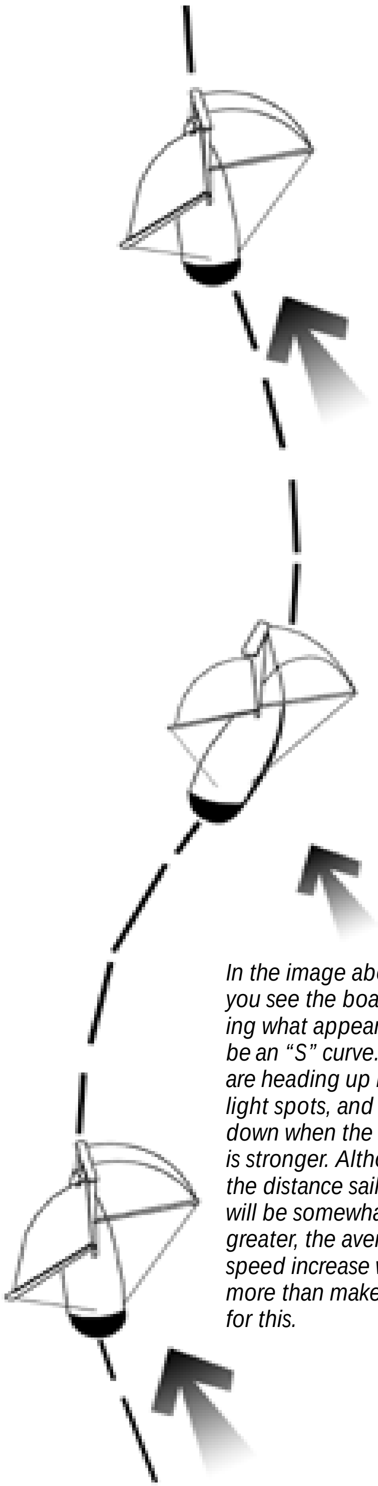
Boats which have really good steering control allow the helmsman to respond more to steering needs. As response to the helm decreases you have to anticipate what the boat needs, and start to work in the helm correction ahead of time.

Steering Technique

As we've said before, there is a basic premise to all downwind sailing. Head up when the wind is light, and head down when it puffs. This technique applies to an afternoon race in a fleet of high-performance dinghies, and when crossing an ocean.

In the latter case you may be heading up or down of the direct course for several days at a time as the wind velocity changes.

Other times on long passages, especially in the trades, you will find diurnal wind shifts in direction or velocity. You use the same techniques with these, heading into the lulls and away from the stronger winds.



In the image above you see the boat sailing what appears to be an "S" curve. They are heading up in the light spots, and then down when the wind is stronger. Although the distance sailed will be somewhat greater, the average speed increase will more than make up for this.

In lighter winds, when expecting a wind shift (usually from a frontal passage) stay on the tack which takes you away from the new wind shift. In the image above, the boat is sailing in southwesterly flow ahead of a cold front. When the cold front passes over, the winds will switch to the northwest. Note how the boat is always broad reaching (going faster). This technique can reduce the time spent running.

How far you alter course is a function of what your boat can do with the increased angle. Generally, as you approach a speed/length ratio of 1.15 you begin to sag off to leeward as the boat is well powered-up and moving quickly. As the speed/length ratio drops you head back onto a higher course.

Impact of Sea State

As the seas begin to build, or an uncomfortable swell system moves into your area, course changing options are reduced. Generally speaking, the larger the sea, the deeper the angle you will need to sail.

Keep in mind that the sea state is constantly changing. What you need to do right now to keep moving comfortably will probably change within 12 to 24 hours, allowing a new range of tactics.

Using Wind Shifts

Large savings in passage time can be made by correctly anticipating and using wind shifts. If you expect the wind to get lighter, you will want to be below (downwind of) the proper course before the wind drops, so as to be able to head up on a faster course.

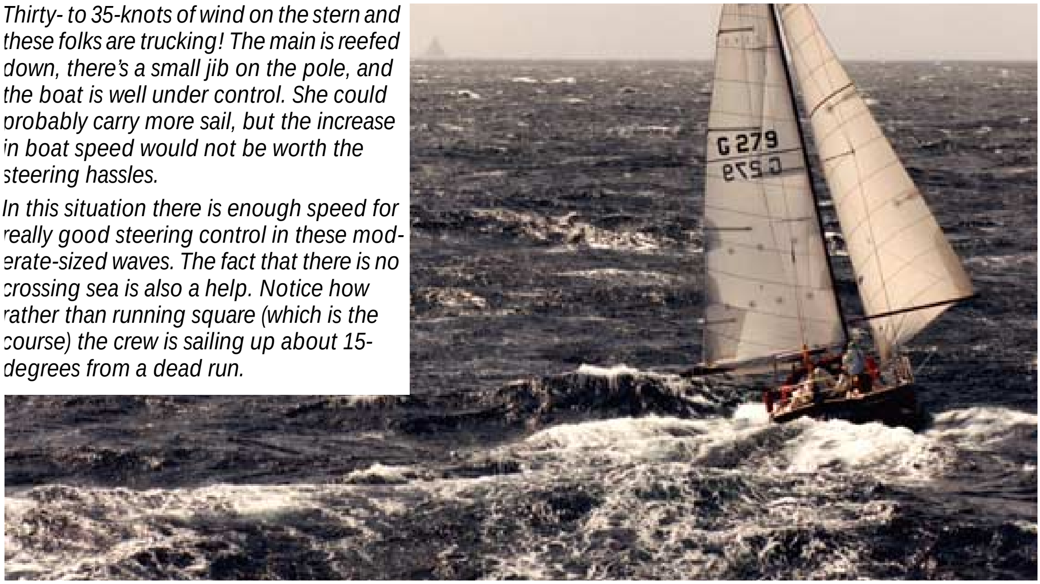
On the other hand, if the wind is expected to increase, try and work your way higher on the course, so that you can sag off with the increased wind velocity.

Wind shifts work on the same principle. If your course is a really deep downwind angle, and boat speed is below a speed/length ratio of 1.15, you will want to jibe against the shifts. In other words, if you are heading to Europe from Bermuda and sailing in a southwest wind, expecting the breeze to shift to the northwest after a frontal passage, you will stay on starboard jibe as long as possible. When the wind finally gets into the west or west northwest, then jibe back onto port tack so you have more of a broad reaching angle (rather than running).

Setting Self-Steering

Getting the self-steering system to hold the desired course further off the wind becomes more difficult. The waves are working harder to move the boat around, and it is more difficult to keep hull and rig balance properly aligned (unless you are running).

With pilots, rudder gain will need to be increased and sea state (dead band) angle reduced to a minimum. Both of these changes will increase power consumption.



Thirty- to 35-knots of wind on the stern and these folks are trucking! The main is reefed down, there's a small jib on the pole, and the boat is well under control. She could probably carry more sail, but the increase in boat speed would not be worth the steering hassles.

In this situation there is enough speed for really good steering control in these moderate-sized waves. The fact that there is no crossing sea is also a help. Notice how rather than running square (which is the course) the crew is sailing up about 15-degrees from a dead run.

Richard Bennett

Cross Chop Issues

If there is a cross sea running, this will have a large impact on the course which can be effectively steered (this subject is covered in more detail starting on page 112).

In general, the best approach is not to try to fight the sea—just accept the course it allows you. This may mean an alternate destination, slowing down a bit, or changing course for a day until the sea state/wind velocity/direction change.

It is not unusual to find a situation where you can sail below your course, or above it, but not right at the destination. If you have a fair idea of what the wind is going to do, it is simple to pick the optimum approach.

The situation is a little tougher here as the boat is sailing with the wind on the quarter. The small jib is setting okay even though the apparent wind is just aft of the beam. Steering will have to be very quick. If the helmsman is even a hair behind any waves kicking the stern around, the boat will round up and it is doubtful there will be enough rudder force to bring the boat back downwind.

The key is to stay ahead of the waves—to anticipate them, and put the helm down to leeward well before the wave (or puff of wind) starts the boat rotating into the wind.

As the Wind Increases

As the breeze picks up so do the steering difficulties for many boats. You may find that the self-steering gear cannot cope and that human intervention on the helm is unavoidable.

Help

Sailing at deep angles when the wind is blowing hard and the seas are running means anticipating the needs of the boat for most designs. Generally speaking, you are working to avoid round-ups. As you feel a wave start to lift the stern turn the helm ahead of the actual course change, so you have a head start. Once you feel the rudder getting a good bite with the increase in boat speed, take some helm off to avoid sailing by the lee.

It may be that it is wind gusts rather than waves which are the issue. If this is the case, you will feel the first tickle of the gust on your neck or cheek. This is the point to start cranking in some early corrective helm, before the gust gets ahold of the boat.

Yacht design, rig configuration, and displacement all have big impacts on how this technique is used. The faster the boat the more benefit to jibing at sharp angles in light winds (aboard *Beowulf* we jibe through 80 degrees—40 degrees up from dead downwind in winds of 11 knots or less. In 20 knots of wind we jibe through 65 degrees).

Ketch and schooner rigs, which have blanketing problems between their sails, do better jibing at broad reaching angles than running.

On the other hand, boats with big mains and small forward triangles can sail deep angles more efficiently.

In the end, in a cruising context, it will be motion and ventilation rather than pure boat speed which dictates the best angle.(A more detailed discussion of this subject will be found under weather tactics.)

Jibing Downwind

When you head up from a run, boat speed accelerates and apparent wind moves forward. Because you are going faster with more apparent wind pressure (and better apparent wind angles) the motion of the boat steadies down. You also get much better ventilation on deck and below.

This approach is particularly beneficial when running in the trades in sloppy conditions. "Trade wind roll" can frequently be eliminated (along with all the slamming and banging that accompanies it!) by heading up 15- to 20- degrees in course.

Extra Distance vs. Speed

When you head off your course obviously you are going to be sailing a longer distance. The question is does this lengthen your trip, or do you break even, or get there faster because of the change in boat speed helps more than the extra distance sailed hurts (see the table nearby)?

Consider the following: if you head up 15-degrees from the actual course you are going to travel an extra three-and a-half percent in distance. If you are running at six knots this means you need to increase your speed to 6.2 knots to break even. At a 20-degree change in course the extra distance is 6.5-percent and at 30 degrees it is 15.5-percent.

Often it is possible to not only go more comfortably, but to improve passage times in the process.

Wind and Wave Factors

The lighter the winds the more benefit to jibing downwind. As the breeze increases, and you begin to sail faster (approaching hull speed), there is less advantage in the higher angles.

Sea state is another major factor. You will often find that wind waves diverge from the wind 15- to 20-degrees. Sometimes there will be a secondary set of swells as well.

Your decision on if or how much jibing angle to use will be based on what angles get you the most comfortable ride (the smoothest ride is usually the fastest ride).

Generally, the angle which keeps you most closely aligned with the swells works best. But conditions are always changing and it pays to vary your approach from time to time to see if the situation can be improved.

Jibing the Main

The best technique to use when jibing varies with wind and sea state as well as the structural capabilities and layout of your rig.

The more robust your boom and gooseneck hardware, the more force you can tolerate when the boom comes across.

The force on the boom is a function of the mass (weight) of the boom and sail, and how fast this is moving as it swings across the deck.

In lighter airs most boats will tolerate an uncontrolled boom during the jibe. In other words, you put the helm down and when the main is by the lee sufficiently, across it comes. Since the breeze is light, the forces are not that great as the boom fetches up on the new side.

But at some point the shock loading of an uncontrolled jib begins to pose structural risks to the boom and gooseneck (and perhaps the mainsail itself).

Reducing Jibing Loads

There are several things you can do to reduce jibing loads. The first is to jibe at the point when the boat is accelerating down a wave. This reduces apparent wind, and since the force on the rig is a function of the square of the apparent wind velocity, small changes in apparent wind strength make for big changes in loading.

When using this approach take care that you don't complete the jibe just as you are slowing down at the bottom of the wave. At this point apparent wind builds quickly and will be at maximum force before you know it.

If your vessel doesn't readily surf, wait for a lull to jibe.

There are a couple of tricks to the jibing process. We like to start by heading up just a hair from a dead run. This makes it less likely that the boom will jibe across prematurely (the main will become unstable as you crank it close to the centerline—heading up 10- or 15-degrees makes sure it will stay to leeward).

The boom is then cranked in as fast as possible. The tricky part of this is the period when the boom is in the reaching to beating position as it may start to oscillate back and forth.

Once you've got the boom close to the centerline you can then put the helm down and jibe across.

Unless the boom is really strapped in it is going to go across with a bang. The more slack, the more shock load there will be.

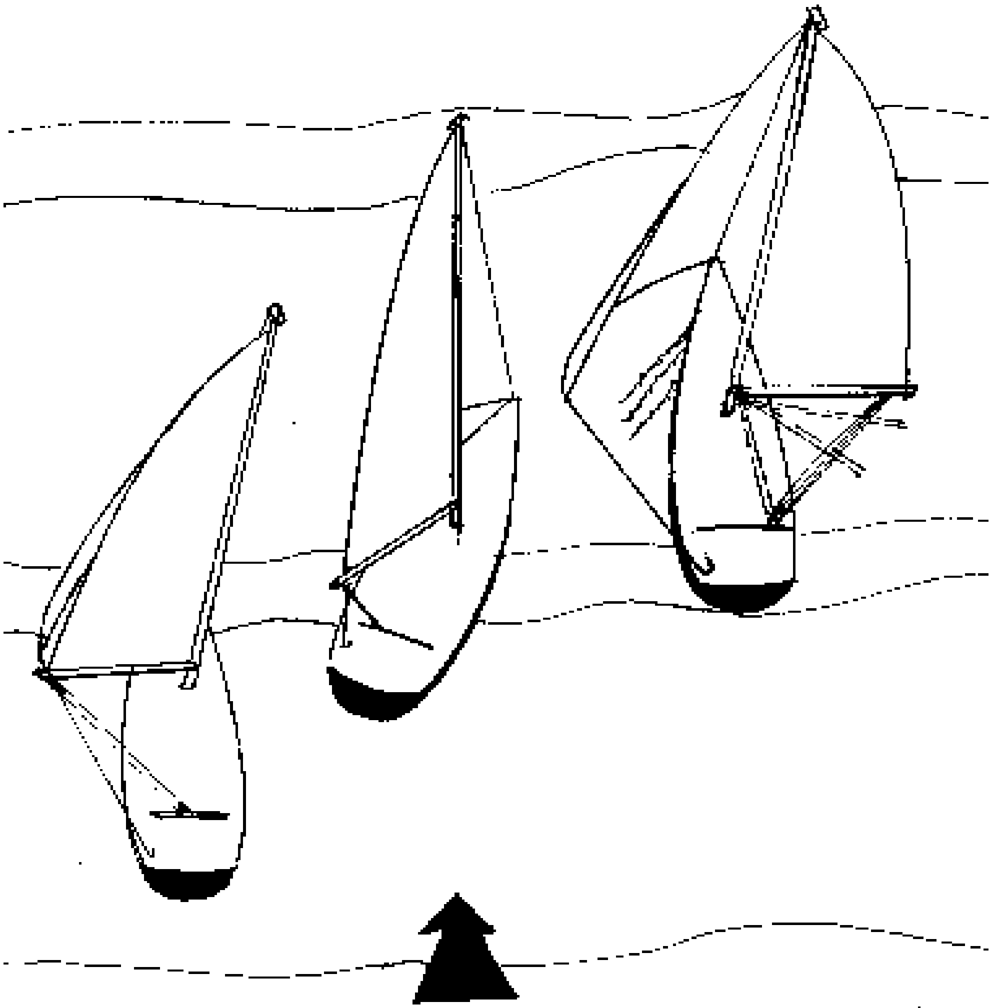
What we like to do is to allow the sheet to slip on the winch as the boom comes across. The sheet is fed through the winch at a very fast clip so that there is no hard spot for the boom to fetch up against.

There is a technique in doing this which involves the correct amount of wraps on the winch and then a certain level of hand pressure. The right combination will vary with the wind, your boat, the type of sheet, and how rough a surface there is on the winch drum.

Jibing check list:

- ❏ Running backstays cleared out of the way.
- ❏ Get headsail off pole and sheeted to leeward.
- ❏ Ease boom preventer.
- ❏ Oversheet headsail to prevent headstay wraps.
- ❏ Head up from course 10- to 15-degrees to reduce chance of accidental jibe.
- ❏ Bring main to center.
- ❏ Keep main vang tight to prevent top of sail from wrapping around upper spreaders.
- ❏ Head down across wind to new jibe.
- ❏ Ease mainsail rapidly, using hand as brake on winch.
- ❏ Get the sail all the way out to reduce chance of jibing.
- ❏ Head up from course to stabilize boat until main is all the way out and preventer is set.
- ❏ Reset headsail to windward.

If it is blowing really hard, or the sea state is making you nervous the headsail can be rolled (or the spinnaker snuffed) before jibing. Or, you can "chicken jibe" which means tacking the boat rather than jibing.



From left to right, start by bringing the headsail off the pole and bringing in the sheet a bit. Next, center the main boom, or at least bring it in to where the boom is over the outer edge of the traveler. Come up 10- to 15-degrees on course (into the wind) to stabilize the boat and reduce the chance of an accidental jibe. Then head back down and across the wind to the new course. Quickly ease out the sheet on the new course and set the preventer. Remember to head up from the downwind course until the main is well out and prevented. The last step is to bring the jib through.

For example, on *Sundeer*, in 25-knots of true wind, we would normally have three wraps of the main sheet on the drum, and then use very light hand pressure to control the rate at which the sheet eased.

The best way to find what is right for you is to practice in light to moderate conditions first, and then work up your jibes in some real breeze after you get a feel for the system.

SPINNAKERS

Most cruising sailors look upon the spinnaker as something they'd rather not deal with. Yet in the right weather, properly set up, it is not that difficult to handle and adds significantly to the fun as well as the speed meter.

Handling the spinnaker pole can be quite simple (see the next section). Sailmakers have learned how to make stable sail designs for day sailing and cruising. And the control socks made by ATN make hoisting and dousing straight-forward in most conditions.

In light to moderate downwind sailing you can easily add 15 to 25 miles a day to your runs, and be more comfortable in the process.

Al and Beth Liggett, (above), using their secret weapon in Papua New Guinea.

Fun for day sailing, it is on long passages where the spinnaker really comes into its own.

When to Use a Spinnaker

Sailing with a chute requires more attention to the boat, the course steered, and the weather. The amount of care depends on the size and construction of the chute (heavier sails give you more leeway with mistakes). It also depends on the stability of your boat and how well she steers under vane or pilot (or human if you're out for a day sail).

The better steering control you have, the more aggressive you can be with the spinnaker.

Of course weather is a major variable. If conditions are unstable you will want to keep a close eye on the situation or perhaps defer the use of the spinnaker to another time.

We tend to carry our spinnakers more than most people. We like to get our passages over with and have learned that for the most part we can take the squalls in stride. We've been knocked down with a spinnaker perhaps eight times in the last 25 years, and it usually is not that big a deal. But it can get expensive if the chute tears!

We have a couple of generalized rules for when to use our chute. The first is that in very light airs, and/or sloppy conditions we don't. In these conditions the chute is going to be very tricky to fly.

Next, in unstable conditions and/or with the mean wind speed above 20-knots, we stay with a single or twin jibs.

In between these speeds at running to very broad reaching angles we'll carry the chute.

In the trades we try to evaluate the squall activity in late afternoon. It usually picks up at night. If the night looks questionable we may change down from the spinnaker to the reacher. But if conditions are light, where we feel we really need the spinnaker, we use the radar as an early warning system for squalls. If we see a couple of dots on the screen we don't worry. But as the squall starts to become well organized, perhaps a couple of miles or more across, we douse the spinnaker well before it hits.

As the wind angle goes more towards a broad reach from a run, we can carry the spinnaker in a bit less wind at the lower end of the wind speed spectrum. However, because of stability and control limitations, as the wind goes forward the top wind speed in which we carry the chute comes down too.

We are happiest using the spinnaker between 8- and 16-knots of true wind speed on a broad reach.

Setting the Spinnaker

When you are racing the spinnaker set is a critical maneuver, which is hopefully executed to perfection, so that as your bow turns downwind around the weather mark the spinnaker immediately fills.

When you're cruising time isn't essential. It is far more important to get things done *smoothly*, and if it takes 10 or 15 minutes to do things right, so be it.

If the sea state is sloppy, or if the wind is very light, we'll set a spinnaker net first (to prevent the spinnaker from wrapping around the headstay).

Next, the sheet and guy are run and attached to the lifelines to leeward.

We'll then bring the spinnaker halyard to the same point as the sheet and guy and secure it. The lazy (unused) spinnaker halyard and any other headsail halyards are all brought back to the mast.

In the olden days, before efficient socks, we would launch the chute from a "turtle". This was a nylon bag with a round top that had a removable canvas lid. We'd stuff the chute into the turtle starting with the bottom by holding the two clews together.

We'd then keep both leeches together as the sail was pushed into the turtle, ending up with the head, and two clews overhanging the edge.

Today, you will have your spinnaker held in a sock. The key with the sock is to hoist it so that it doesn't get twisted on the way up.

We always set the spinnaker in the lee of the mainsail.

Once the socked sail is hoisted, the tack is pulled out towards the pole end, the sock raised and then the sheet is trimmed.

If the air is light to moderate, you can raise the sock with the sheet partially sheeted. But if the breeze is at all strong, it will be better to leave the sheet slack and the guy eased off so the pole is well forward, keeping the unfurling spinnaker in the lee of the mainsail until the sock is all the way up.

Keep a secure grip on the sock downhaul line, or a turn on a winch or cleat. As the sail fills it will try to force the sock up and in a strong breeze the forces on the downhaul line can be quite high.

Launching from a turtle is a little more complicated. You want to keep the spinnaker in the lee of the main, where it will stay collapsed, until it is fully hoisted. Then trim the guy, and after this the sheet.

While the chute is in the lee it can be easily hoisted. But once it starts to fill, it will be very difficult to finish hoisting the halyard. If the sail fills prematurely, the best thing to do is head off dead downwind, allow it to collapse in the lee of the main, and then finish hoisting. This may also involve easing the guy so the pole goes forward.

En route to the Marquesas from Mexico, aboard Intermezzo. We're broad reaching with the full-sized running chute and a mizzen staysail. The pole is squared to the apparent wind angle, and raised to where it and the clew are at the same height. The sheet, which doesn't show here, is led a bit forward of optimum, to keep the sail from oscillating.

With this rig Intermezzo was 25 miles a day faster than twin jibs, if the wind was under 16-knots.

Spinnaker Trim

The basic rule about spinnaker shape and trim is that as the leeches get closer the sail becomes deeper (or fuller). If you raise the spinnaker pole, the leeches separate, flattening the sail. Conversely, as the pole is lowered, the leeches become closer together and the sail has more draft.

When you are reaching you will want the luff of the spinnaker to break evenly, the same as with a jib. If the pole is too low the luff will become too full and break early. If the pole is too high the luff becomes unstable and you will need to over-trim.

Of course all of this varies with the shape of the sail, not to mention the wind angle, velocity, and sea state.

When we started sailing we had a simple way of judging spinnaker pole height. The basic rule was to have the pole at the same height as the clew. This still works well as a general approach for cruising.

When the wind is well behind, beyond 125-degrees apparent, we find it best to keep the pole at right angles to the wind. This creates maximum separation from the mainsail.

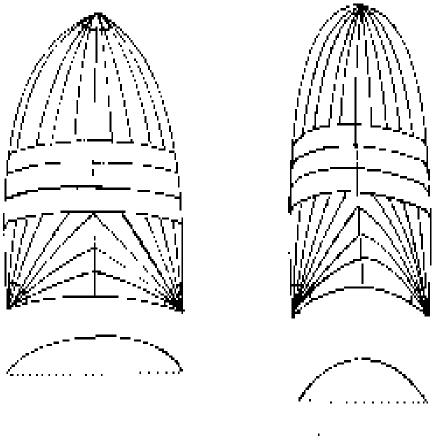
However, as the breeze moves forward to where the boat is reaching more, the pole is let go a bit more forward than right angles (over-squared). This helps to separate the two leeches, flattening the shape (which is better for the closer wind angles).

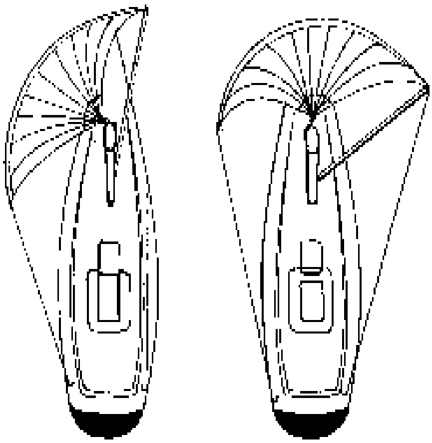
Help

The left upper drawing shows how the spinnaker is flattened as the two edges (leeches) are moved apart. The right drawing has them closer together with more depth in the sail.

You typically raise the pole and ease it forward when reaching in order to flatten the sail (lower left). As the pole is squared back with the wind more on a broad reach or run, the pole is lowered and the sheet brought forward on the rail to bring the leeches closer together and add draft. The fuller sail is also more stable.

The photo below shows a chute with the pole and sheet both too far forward, to help stabilize the sail. This is slower to trim, but makes it easier to control the spinnaker.





The spinnaker sheet and its position on the rail is similar to that of a jib. You run the toe rail block forward for more power and draft, and ease it aft to allow the leech to twist off and flatten the top of the sail depowering it in the process.

The closer to the wind you are sailing, the further aft will be the lead. The deeper the wind angle, the further forward the sheet.

In general, once the pole is set, the sheet is trimmed the minimum necessary to keep the sail from collapsing.

So far we've been talking about maximizing spinnaker performance. But in a short-handed and/or passaging context other issues begin to emerge. One is sail stability. You do not want to be constantly trimming the spinnaker to every change in windspeed or direction.

You also don't want to be adjusting course all of the time to keep the sail filled.

Because of this it is generally best to set the pole a little more forward. We generally set it 10- to 15-degrees further forward than optimum for racing.

Next, the spinnaker lead car is run forward on the toe rail so that the sail is a little more full. Then, the sheet is overtightened a bit.

The effect of these three adjustments (pole forward, lead block forward, and sheet tight) is to create additional draft in the sail. This makes the spinnaker more stable and easier to fly.

Help

A perfectly set spinnaker on a fresh run. The clew and tack are even in height above the water and the pole is set just a hair forward of square to the wind (to reduce rolling).

Richard Bennett

Sailing here on a much lighter day—about five to six knots of wind. These folks are sailing almost square to the wind and might benefit by heading up and heating the boat speed a little. They would sail a longer distance, but in these light airs the extra boat speed would probably more than compensate for it.

Note the raised outboard end of the pole. It brings the tack even with the clew. However, if the butt end of the pole were raised, so the pole was parallel with the water, it would project slightly further forward, away from the mainsail, and be faster.

Asymmetric Chutes

Asymmetric chutes are more efficient for reaching than symmetrical sails. When they are tacked off the anchor roller, or on the headstay, they are also somewhat easier to fly due to the elimination of the spinnaker pole. However, for broad reaching and running they are quite inefficient compared to a sail which is tacked on a pole.

The partial exception to this is for a boat with a bowsprit of some sort. In this case, you get back some (but by no means all) of the lost efficiency by projecting the sail well forward of the boat and adding to its area.

In either case you never run with these sails. If the destination is dead downwind it is faster to get there by jibing back and forth, so that the apparent wind is far enough forward that the sail fills nicely and stays out of the wind shadow of the mainsail.

Trimming an asymmetric sheet is similar in logic to a symmetrical chute. The further forward the apparent wind, the further aft the lead block on the rail and the further aft the wind the further forward the lead block.

Luff tension works differently than on a symmetrical chute.Tighten the downhaul to pull draft forward in the sail and make it more genoa-like. Ease the luff when sailing at broader angles to make it easier for the sail to rotate to windward.

With a bowsprit the usual way to jibe is inside the luff, the same as if you were jibing a genoa around a cutter stay (except now the cutter stay is actually the headstay). We've found that it works best if the sheet is eased as you head downwind until the clew of the asymmetric is about even with the bow. Then, before jibing we start to pull the sheet through the slot between headstay and spinnaker luff.

The key here is to get enough of the sail through the slot before jibing so that the sail doesn't blow in front of the luff.

When the asymmetric is tacked near the headstay there are two choices. First, drop the sail and re-set it after jibing the mainsail. Second, jibe the asymmetric around the *front* of its own luff. In the latter case the sheet will be eased so that the clew of the sail is flying all the way downwind, ahead of the boat. Once this point is reached you begin the long grind in on the new sheet. Note that this requires extra long sheets.

Asymmetric cruising spinnakers, which are used on masthead rigs and are tacked to the bow, usually have to be jibed by letting the sheet all the way out and pulling the sail around the front of its luff. There simply is not enough space between the luff and fixed headstay to get the sail through cleanly. The alternative is to sock the sail, and then flip the sock around the headstay, and then unfurl.

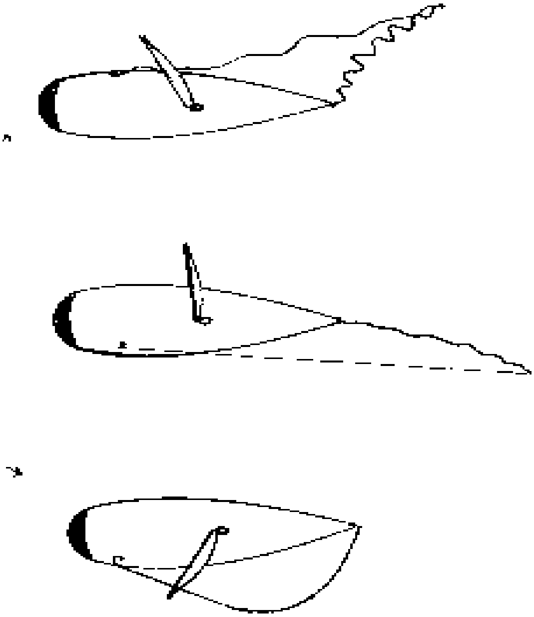
Help

Asymmetric cruising spinnakers are great for day sailing. For close to broad reaching they are hard to beat, especially if one of the new race-developed cuts is used. These sails develop more power with less drag than symmetrical shapes.

But as the wind goes aft toward a broad reach or run these sails get harder to fly and become considerably less efficient than a symmetrical chute. Often on a run a jib on a pole will be as fast or faster than an asymmetric chute flown on the centerline.

This sail is nicely set. The only improvement might be to ease the tack off a bit which would allow the sail to fly somewhat more freely and perhaps rotate around to windward.

The lower left photo was taken just after we'd set Beowulf's two spinnakers during sea trials in Auckland, New Zealand. Both sails are oversheeted—the forward spinnaker by a huge amount. (Normally we'd trash this photo and not admit we could be that far off). The upper photo shows both spinnakers trimmed properly. Note how the forward chute is projecting forward, something you always want with asymmetric spinnakers.



Jibing an asymmetric chute where there is no room between its luff and the headstay takes long sheets. As you turn downwind, well before you reach dead downwind, the sheet is eased so the sail flies out well forward of the headstay (top drawing). As the boat is turned past dead downwind the sheet is trimmed on the opposite side and the sail trimmed.

Sometimes it is easier to just sock the sail, switch sheets between the headstay and sock, and then unsock.

Twin-Pole Jibing

Twin-pole jibing is the most secure way to handle the chute. When the chute is initially set up there are two sets of sheets and guys attached (so you would not do this in light airs!). Next, the boat is squared away dead downwind. The second pole is hoisted into place and the lazy guy attached to the clew of the spinnaker, is connected to the end of the pole.

The spinnaker is now firmly held between two fixed poles.

This happens to be a very stable way to fly a spinnaker when running, and is especially helpful if there is a sloppy sea or a tendency for whatever reason for the boat to oscillate. Using twin poles other than to jibe is illegal in racing, but a good use of the equipment when cruising.

To finish off the jibe bring the mainsail across and then once it is settled down the spinnaker pole, which is now to leeward, can be lowered back down to the pulpit.

When we find ourselves doing a fair amount of jibing like this we leave the leeward pole attached to the mast, with the guy through the end of the pole, so it is ready to go the instant we need it.

Single-Pole Jibe

Most yachts, especially those under 50 feet (15 meters) have a single spinnaker pole. In this case the jibing requires more careful coordination between the members of the crew.

The basic principle is simple enough. As you square away downwind the pole is tripped free of the spinnaker. The inboard end of the pole is hoisted a bit and the outboard end dropped to just above deck level. It is then guided across the foredeck until it has passed the headstay (if there is a cutter stay it will have to be removed before the jibe starts).

There are two approaches to connecting the spinnaker guy to the pole. The first is to simply have the guy in your hand and drop it into the end of the pole. This is feasible in light airs and on smaller boats. But as the breeze increases and/or the vessel size grows, you will want to have a lazy guy attached to the sail which can be hooked into the end of the pole while the sail loads are still being taken by the sheet—now on the windward side of the boat.

The tricky part of this equation is that during the period the spinnaker is free of the pole it can easily begin to oscillate unless the boat is steered quite precisely. This means someone on the helm has to have a reasonable amount of skill. In a short-handed context the crewmember working the foredeck is going to be on his own. While this is certainly doable with some practice (and the right sea/wind conditions) it is also a situation where you can get into trouble.

If you are at all in doubt, drop the spinnaker (or sock it), jibe the main, re-set the pole, and then re-hoist on the new leeward side.

The next thing that can be done is to oversheet the sail and let the pole go forward a bit. As we stated earlier, this gives the sail a fuller shape, while the corners tend to be more stabilized.

Death roll is a colorful term used among racers to indicate a condition where the head of the spinnaker begins to oscillate side to side when you are sailing at very deep angles (usually running dead downwind in strong winds). Each roll gets progressively worse unless corrective action is taken. At some point the boat will broach or spin out (either to windward or leeward).

If you do detect the beginning of oscillations here are a couple of easy things to do:

First you can try to correct the problem by steering the yacht under the masthead. In other words, if the spinnaker has pulled you to port, you steer to port until you are aligned again under the masthead. In order for this to work you need a vessel which is very responsive to her helm.

An alternate approach is to head up 10- to 15-degrees or so on course and get the sail onto a broad reach. This will immediately stop the oscillations.

Help

Avoiding problems while cruising with spinnakers:

- ❑ Avoiding sailing dead downwind. Keep the breeze at least 15-degrees above downwind.
- ❑ Carry spinnaker pole slightly more forward than optimal.
- ❑ Move spinnaker sheet lead forward.
- ❑ Overtrim sheet to reduce rolling.
- ❑ Never knot guys or sheets (so they can be run free in an emergency).

We have carried all sorts of spinnaker designs on a variety of boats. We have, on a couple of occasions, had a boat start to oscillate, but the head up and overtrim approach has always stopped the sequence before it got seriously out of control.

Hourglasses

Whenever you are sailing at very deep angles there is a risk of the spinnaker starting to oscillate, and then turning itself into an hourglass shape.

The lighter the winds, and the sloppier the sea-state, the more risk there is.

If an hourglass does occur you need to react quickly to work out the twists or the spinnaker may continue to wrap itself tighter and tighter.

The best way to get rid of an hourglass is to overtrim the sheet and/or square back the pole at the same time. This will start the unwrapping procedure from the bottom.

If this doesn't work right away, then ease the pole well forward and overtrim the sheet, so that the sail is in the lee of the mainsail. It will then collapse and you can usually pull on the sheet to start the unwrapping process.

Sometimes there is nothing you can do to work out the twist and the sail has to be dropped and untwisted on deck.

To avoid an hourglass in the first place do not run square. Instead, keep the boat on a bit of a broad reach and the sail will never have a chance to get unstable and start the oscillations which lead to the hourglass.

Headstay Wraps

The same mechanics which lead to death rolls and hourglassing can also lead to a headstay wrap.

Basically what happens is that the spinnaker hourglasses itself around the headstay. When this happens you no longer have the option of dropping the sail.

You can pull on the corners to try to start it unwrapping. If this fails it is sometimes possible (in light airs) to steer the boat back and forth under the oscillations of the wrap and get the oscillation direction to reverse.

Occasionally neither of these approaches works and you end up having to cut the sail free, a most disagreeable task. In this case you will need a halyard on which to go aloft, which is one of the reasons why it is best to bring *all* lazy halyards aft to the mast before setting a spinnaker (otherwise they are liable to become wrapped up inside the chute rendering them useless!).

Once again, the way to avoid this problem is to sail on a broad reach rather than a run, and do a little oversheeting to stabilize the sail.

Finally, by using a spinnaker net (a very simple device—see page 107 in *Offshore Cruising Encyclopedia* for how to make one) the possibility of a headstay wrap is eliminated.

With hourglasses and headstay wraps it is often possible to jibe the boat and have the reversed air flow over the spinnaker undo the problem.

Spinnaker Takedown

Over the years we've found that the easiest way to get the spinnaker down is in the lee of the mainsail. The technique works like this: First, run off dead downwind, with the main eased all the way out.

Next, ease the spinnaker pole against the headstay. Then trim the spinnaker sheet tight, bringing the leech of the spinnaker against the lee side of the mainsail in the process.

If you are running downwind the spinnaker will collapse back into the mainsail. When this occurs, ease the afterguy so that the luff of the spinnaker folds into the main as well.

The sail can then be lowered onto the deck.

In moderate conditions I will work the foredeck by myself, easing the halyard with one hand, gathering in the chute with the other.

If it is blowing above 12- or 15-knots apparent, Linda usually comes forward after the guy has been eased. She will control the halyard drop while I use both hands on the chute.

The preceding applies to a conventional takedown (without a sock). With a sock it is still best to collapse the spinnaker in the lee of the main before drawing the sock down. However, you will have to leave a little slack in the spinnaker sheet so there is room for the sock (otherwise it will get caught up on the main).

Linda and I have taken down spinnakers in 35- to 40-knots of wind (without socks) using this process (when we've been caught by a squall).

There are many factors which contribute to the death roll syndrome. Spinnaker design, hull and rudder configuration, wind speed, and finally helming are all part of the equation.

Modern spinnaker designs and/or modern yachts with good downwind performance are less susceptible to this phenomenon.

To drop the spinnaker when conditions have turned boisterous:

- ❏ Run off square to the wind.
- ❏ Ease mainsail all the way out against the shrouds.
- ❏ Trim spinnaker sheet tight so the spinnaker leech is against the mainsail.
- ❏ Ease spinnaker pole afterguy until sail collapses in the lee of the mainsail.
- ❏ Drop sail or use spinnaker sock while spinnaker is collapsed.

Emergency Release

In the event of an emergency, perhaps a man overboard, it may be necessary to get the spinnaker down as fast as possible.

If you are short-handed, and don't have time to remove the spinnaker conventionally, there is a fast alternative; cutting the sail loose.

The concept is to cut the sail free in such a manner that it blows away from the boat and does not foul the keel, rudder, or propeller.

From first-hand (costly!) experience what seems to work best is to cut the sheet first, then the guy, and finally the halyard. During this process the apparent wind should be aft of the beam so the sail cannot catch the rig.

If you are in a knockdown scenario, with the wind well forward of the beam it works better to cut the sheet, then the halyard, and then instantly after the halyard cut the guy.

These photos were taken aboard Intermezzo II, working with her 25-foot (7.7-meter) spinnaker pole. This was a huge, heavy aluminum pipe, with which we had to take care.

In the top photo the pole is secured to the deck in front of the mast (the upper end is on a toggle, attached to a track, which runs to the lower spreaders). Once the fore- and afterguys are rigged, the pole is walked forward and outside of the lifelines. In the bottom photo the jib sheet is being dropped into the jaw at the end of the pole. Note that the pole is quite far aft in this image. This is the wrong way to do things—which we learned the hard way. This puts too much stress on the mast fittings and will eventually lead to failure.

Handling the Spinnaker Pole

Making spinnaker pole handling easy on most yachts is a function of practice, and correct rigging. If you practice with the pole first at the dock, and then offshore in smooth water and light airs, you will have a chance to get used to the process before conditions are more demanding.

By the time you can set and remove the pole in the dark, working by feel, you will be ready to use the pole offshore.

Mast-Mounted Systems

When we started cruising we thought having a pole permanently stowed on the mast was the answer. However, we learned that there are a number of drawbacks to this approach.

There is a lot of extra weight and windage aloft, neither of which are desirable when reaching and beating. Next, in most cases the poles tend to rattle or vibrate and the noise is transmitted to the interior down the mast.

As a result, even though we've had vertical storage provisions on a number of our own yachts, we've always stowed the poles on deck when we were not broad reaching or running.

When you use a mast-mounted pole care needs to be taken when changing the pole into a horizontal position. Pulling on the bottom of the pole you have a huge lever arm. Small amounts of force result in huge loads at the mast connection.

So, you need to be sure that the bottom of the pole is walked forward until the pole has at least a 30-degree angle, before you let go and begin to

Help

The pole in this image has a much better angle. This is the correct way to deal with it. Note how the pole rests against the top of the life-line stanchion. In moderate seas, the stanchion head will keep the pole in place.

How about those cool pants?

tighten the topping lift.

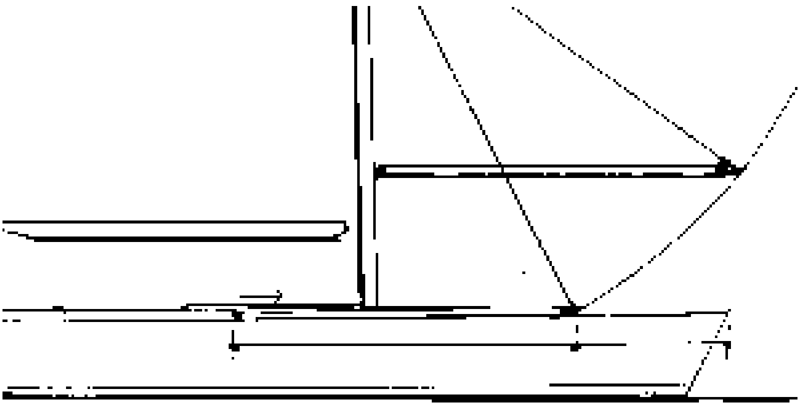
Never try to rotate the pole outboard from the bottom end. This usually ends up bending the mast fittings. After a number of these bending sessions there will be a crack, and then finally a failure at which point the inboard end of the pole will come crashing down to the deck.

Setting the Pole

The key to setting a spinnaker pole is to get the butt (aft) end onto the mast as quickly as possible. Once this is accomplished the pole is under control.

When we started sailing *Sundeer* we decided to try a new system for getting the pole onto the mast.

The key is where the pole is mounted on deck. The outboard end needs to be about third of the pole length back from the headstay.



With the pole mounted far enough forward on deck, when you push it forward against the topping lift, it will automatically raise itself.

With this system on Sundeer one person was able to get the pole off the deck and onto the mast, ready for use (as long as the sea state was moderate).

Help

Fernando Goes sets the carbon fiber spinnaker pole on a Sundeer 60 during sea trials. If conditions were rougher there would be someone guiding the outboard end.

Handling mast-mounted spinnaker poles:

- ❏ Always walk pole forward, so as not to bend the inboard end.
- ❏ Attach fore- and afterguys, and then drop sheet into pole end.
- ❏ Raise pole with topping lift.
- ❏ Square pole back to proper position for jib or spinnaker.

Deck-stored poles:

- ❏ Get butt (aft) end attached to mast as quickly as possible so it is under control.
- ❏ Rest the forward end on the pullpit, or lifelines. Be sure it is secure so it cannot roll off (use a quick tie if required).
- ❏ Rig guys, sheet, and topping lift.
- ❏ When hoisting pole keep inboard and outboard ends more or less even.

Once sheets and guys have been run, the next step is to drop the afterguy into the end of the pole, and then attach the foreguy. The last step is to attach the topping lift to the end of the pole.

I then release the pole from the deck chocks, lift the aft end slightly by hand, and shove forward.

The topping lift resists the forward shove and as I increase the force of my push the topping lift begins to lift the end of the pole.

With the right geometry between pole position on deck and topping lift tension, when the butt end of the pole is ready to attach to the mast the pole is sitting horizontally at almost the correct height.

The key thing here is that only one person needs to lift and push.

If there's a bit of sea running Linda will guide the outboard end of the pole, but she does not have to lift.

A more common system is to have one person lift at each end, until the inboard end of the pole is secured onto the mast.

After the butt is secured the forward end can be dropped on deck, rested on the pulpit, or left flying with the topping lift set.

Dropping the Pole

When we're finished with the spinnaker pole we usually leave it on the mast, with the forward end sitting on the deck. This way it is ready to go when we need it again. Of course it is in the way of the jib, so you are limited to one tack. But offshore, at least in the trades. this is usually not a problem.

On the other hand, at the end of a passage, we make it a habit to stow the pole before we close with the land, in case we need to sail out of a tight spot in a hurry.

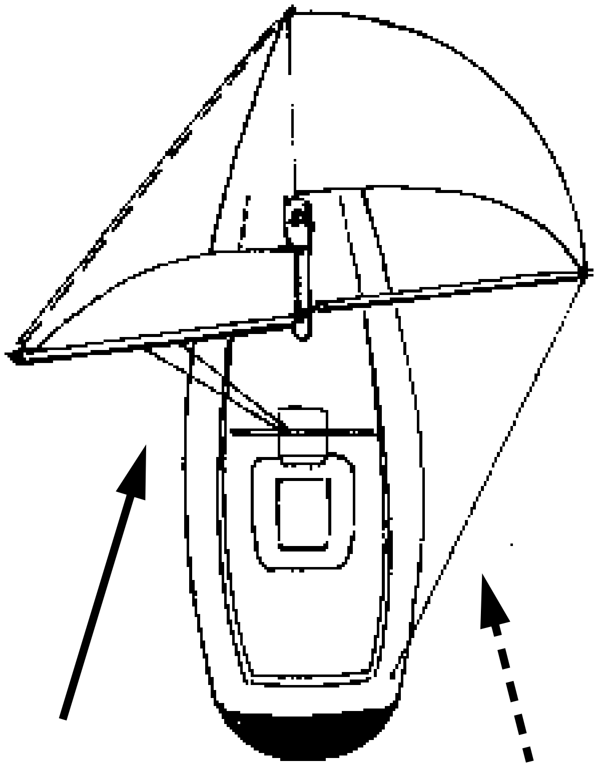
Sailing by the Lee

Normally, you want to keep the wind slightly to windward of a dead run. This is faster than dead downwind, there is less rocking around on the waves, and the mainsail is more stable.

But the time will come when you're running in restricted waters, perhaps the jib is on the pole, and you get a wind shift to leeward.

Now the wind is coming from the lee side, and there may not be room or time to jibe, or you may prefer to wait out the shift and see if the wind goes back to its previous direction.

Assuming the boom is *all the way against the shrouds* and you have your preventer rigged, you can carry the wind as much as 20-degrees by the lee (the exact amount varies with wind shear and the shape of your main). This is not as fast as DDW, and the boat may get a little squirrely on the helm, but it is feasible.



Two wind angles for sailing really deep downwind. The solid arrow (left) has this boat sailing by the lee. You can get away with this in smooth water, with stable winds, if you are trying to avoid a jibe. But make sure the preventer is secure. If you get too far by the lee, and the main begins to jibe, it will rotate the boat up into the wind and you'll end up on your side with the boom sticking into the air. The only way to recover from this is to release the preventer. This must be done smoothly to avoid damaging sails and spars.

The dashed arrow is more of an offshore deep-running wind angle. This leaves the helmsman, autopilot, or windvane a margin of error. Both the sea state and steering characteristics of your boat will affect how much margin is suitable.

Offshore, with the seas kicking you around, sailing by the lee is to be avoided, lest it lead to an unforeseen jibe and broach. With the autopilot or windvane steering it is usually not possible to steer accurately enough to prevent getting by the lee, so a margin of error needs to be built into the course selected.

When steering by autopilot, with the rudder gain turned up high, it is not unusual to find too much helm being applied, especially if you are surfing down the wave faces. This can lead to an accidental jibe. All of these autopilot problems are exacerbated when heading close to north (northerly heading error) as the force of the magnetic north pole on the compass is at its smallest when you are aiming directly at it.

Help

Preventers can be tricky to rig. They go to the end of the boom so they have maximum leverage (and minimum load) which means on occasion they conflict with jib or spinnaker sheets, as shown in the left photo. The dashed arrow indicates the preventer and the solid the spinnaker sheet. In this case the sheet is lead inside the preventer. However, if the boom trimmed a bit tighter, the sheet would probably be rigged outside the preventer.

PREVENTERS

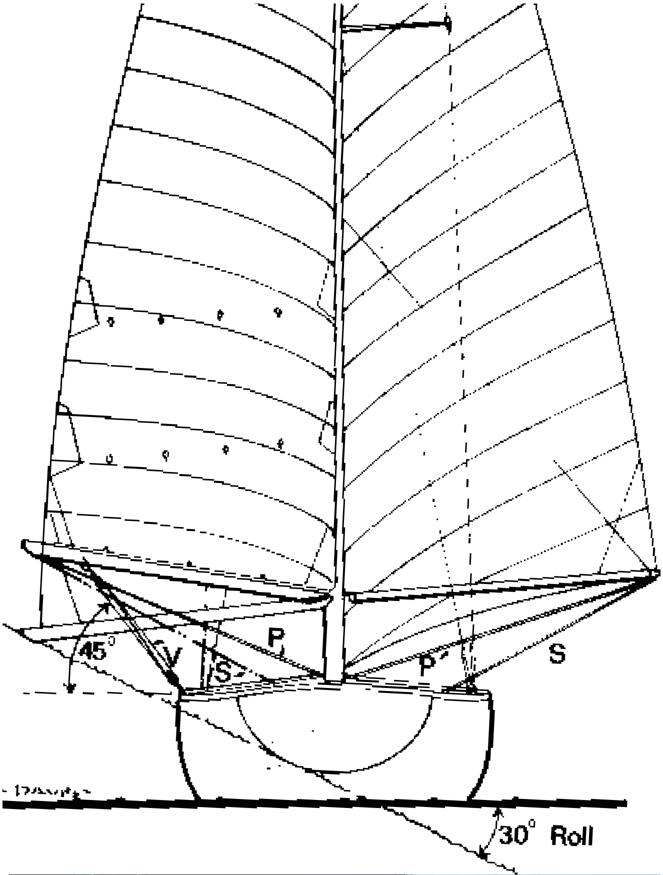
When you start to sail at really deep angles, especially with unstable wind or sea conditions, using a preventer on the main boom makes a lot of sense.

This simple control line can save you from damage in an unexpected jibe, and allows you to sleep a lot better when you're off watch knowing the main boom is well under control.

Preventers are usually run from a padeye on the end of the main boom to block or cleat near the bow.

We always bring the end of the preventer back to the cockpit so that we can make any adjustments necessary without going forward. If you pre-rig preventers on both sides of the boat, the weather side can double as a foreguy on the spinnaker or whisker pole.

It is best if the preventer is of a low-stretch construction, and kept quite snug when in use.This reduces wear and tear on the gooseneck as the boom can't oscillate back and forth.



Ideally, you will have a "tripping reef" to raise the boom so it won't drag in boisterous weather. Alternately, the vang can be eased to allow the boom to swing aft when it drags.

When you are sailing along the coast, in stable weather, how the boom is prevented and vanged is not critical. The only real issue is control of sail twist. But as the weather gets more boisterous, and there's a chance of being tossed around by the seas, how this gear is set up becomes of paramount importance.

In this drawing there are several issues to consider. First, the lines marked "P" work as a main boom preventer and a foreguy for the spinnaker or whisker pole.

The sheets ("S") are ideally led as far aft as possible. This reduces loading on the booms and mast. With a jib flown to leeward this angle is constricted by the need to have the leech of the sail under control—so the lead is well forward. But once the headsail moves onto a pole, the sheet can be led right aft.

A boom vang is shown down to the rail. This exerts more force to hold the boom down, the leech straight, and the sail off the spreaders, than a vang which goes from the heel of the mast to the boom. A rail vang also reduces compression loading on the boom and gooseneck fittings. It is shown at a 45-degree angle. This is a maximum, and if the boom doesn't overhang the rail too far, it can be straightened (moved inboard).

The boat is shown in this drawing on an even heel. However, offshore between wind and waves there will typically be some rolling and at times substantial heeling. If the boom drags in the water while it is prevented forward, enormous compression forces build up between the boom and gooseneck.

Help

Richard Bennett

SURFING

Helming while surfing down waves is about the biggest thrill you can have on a boat (with your clothes on). All boats will surf at some point, even heavy displacement designs. The key is knowing the steering characteristics of your boat.

For a detailed discussion of heavy weather downwind steering see our book *Surviving the Storm: Coastal and Offshore Tactics*, starting on page 358.

Almost any vessel will surf in the right conditions. All you need is the correct wave shape for your boat, a push from the breeze, and whee, off you go down the slide. Of course if you broach out of control at the bottom of the wave that may take the edge off the fun.

Some boats will surf under control for long periods of time, others are a bit trickier on the helm.

Even if you don't want to surf, it makes sense to know how the boat will behave and what you have to do to coax it to do what you need as the time may come when conditions dictate that you have no choice in the matter.

Any boat will surf if the sea is big and steep enough. The trick is to get your boat surfing when the sea size is marginal. This can quickly add miles to your daily runs as well as adding to your fun.

In heavy downwind conditions, where the issue isn't so much fun as comfort and safety, surfing can reduce the chances of a knockdown (or worse) keeping you moving ahead of the breaking seas—provided you have the correct technique and the right equipment.

Keep in mind that in all scenarios, the faster you are moving downwind, the lower the loads on the boat as apparent wind drops whenever you accelerate down a wave.

Help

Wave Mechanics

Wave shape, speed over the bottom, and/orbital motion control what you can expect in the way of a surf. The steeper the wave face, the easier it is to get started down the slope. Newly formed steep waves will often give you short, abrupt rides while more mature, stretched-out seas give the longest rides.

A key factor is the wave shape at the bottom or trough, and the existence of any cross chop or cross swell. If there is, this will dictate your approach to both steering and boat speed.

Surfing and Hull Shape

Boats with relatively high prismatic coefficients (full ends) tend to surf better than those with finer ends. Those with flatter exits, i.e., long, flat-tish runs aft, also do well.

On the other hand, a yacht which tends toward a double-ender, with a canoe stern, does not have the buoyancy aft needed to get started down the wave face efficiently.

Balanced hull lines, so that weather helm does not build excessively with heel, become more important as wave size and boat speed increase.

Steering Control

Steering control is the single most important design ingredient when surfing. It is what keeps you from broaching at the bottom, and what makes this a controlled, fun (most of the time) exercise.

A key design factor is the bow shape. If you have a sharply V'd bow, it will tend to dig in making it difficult to steer the boat as she speeds down the wave. On the other hand, rounded or flat bows stay on top of the water as they accelerate making the rudder's job easier.

Boats with spade rudders will fare best. Next comes those with skeg mounted rudders, and finally at the bottom of the steering control pile will be the full- keel attached-rudder yachts.

Finally, you need to look at your length-to-beam ratio. Yachts which are narrower for their length will steer better than those which are fatter.

The Role of Displacement

Displacement plays a big part in how well you surf. The lighter you are for your length, the better you will do at this. Lighter boats get off on the small waves quicker, have longer rides, and are more easily controlled at speed.

Intermezzo had a displacement/length ratio (DLR) of around 300, and while she wasn't a screamer downwind, in a fresh breeze she would get up on the steeper waves and slide down for short periods of time. At the other end of the spectrum is *Beowulf*, with a DLR of 60. She will surf on the smallest waves and in moderate trades, say 20 knots of wind, she can stay on a wave face for minutes at a time where *Intermezzo* would only spend a few seconds on the same wave.

Richard Ben photos both pages

The crew of this boat (both photos) is having a great sail (except it is a bit wet out). In the upper photo you can see the position of the boat on the wave in detail, and in the lower photo you can see where she sits in relation to the seas ahead and behind. She has just taken off on the wave face, had a nice acceleration, and is about to slow down, at which time the wave will pass her by.

To stay with the wave longer, this is the point at which the crew will want to head up 10- to 15-degrees to re-accelerate, so they have the power to stay on the wave face. Once they are surfing at speed, the helm will be pulled down, back on course to leeward.

If your DLR is in the 300 range you can expect to surf in strong conditions. Above this number unless it is blowing a gale you're going to be limited to displacement speeds. As the DLR drops towards 200 surfing becomes more of an expected event, and under this ratio you can look forward to some real fun in cruising downwind!

Help

The fun meter is close to being pegged in this photo. These guys have enough sail flying on a light boat to keep them moving at wave speed most of the time. When this relationship is achieved—wave speed and shape are one of the variables—the boat will stay on waves for periods of up to a minute. Speed is very high, while control, enhanced by the faster water flow over the rudder, remains excellent.

The key is to keep from slowing down by heading up in the lulls or when you begin to lose place on the wave.

Sail Area

Obviously sail area is important. It is the power of the rig which gets you over the face of the wave and onto the slope in front of the crest where the ride is best. It is this power which also allows you to stay with the wave for longer periods of time.

You will find situations where it pays big dividends to add just a little sail area (maybe only a staysail or one size up in jib). That small extra

Help

Richard Bennett

As you begin to climb the wave ahead (as shown above) it usually works best to head up towards the wind anywhere from five to fifteen degrees, to help maintain speed.

amount of oomph is what gets you going down the waves in situations where otherwise the wave would slide under the hull without giving you a boost.

Helming in Higher Performance Boats

Assuming surfing conditions are marginal, the issue will be catching the wave as it rolls under the hull. To do this you need to head up 15- to 25-degrees, accelerating the boat just before the crest approaches. As the crest begins to pass under the stern you pull the bow back down to a broad reach (or deeper if that's your course and/or if the wind is blowing hard enough).

As the boat accelerates down the wave face you can head lower on your course, keeping the apparent wind at a constant angle in the process (the apparent wind will move forward as you accelerate).

Towards the bottom of the wave you will begin to decelerate. The trick here is to heat the boat up, i.e., head up again to gain speed so that you can climb the back side of the next wave, or stay on the face of the wave you have just been riding.

If there are cross seas they will usually be a problem towards the trough of the wave. You may have to head up (or in some cases down) to avoid impact or to minimize boat speed loss with the cross wave action.

As the waves get bigger, and the wind really starts to blow, at some point you will face the issue of driving into the back of the next wave.

If you continue straight down the wave, right to the bottom, and the backside of the next wave is steep, there's a chance of stuffing the bow. Normally this will lead to an abrupt reduction in boat speed, bringing with it high loads on the rig. It can also result in a lot of water on the deck.

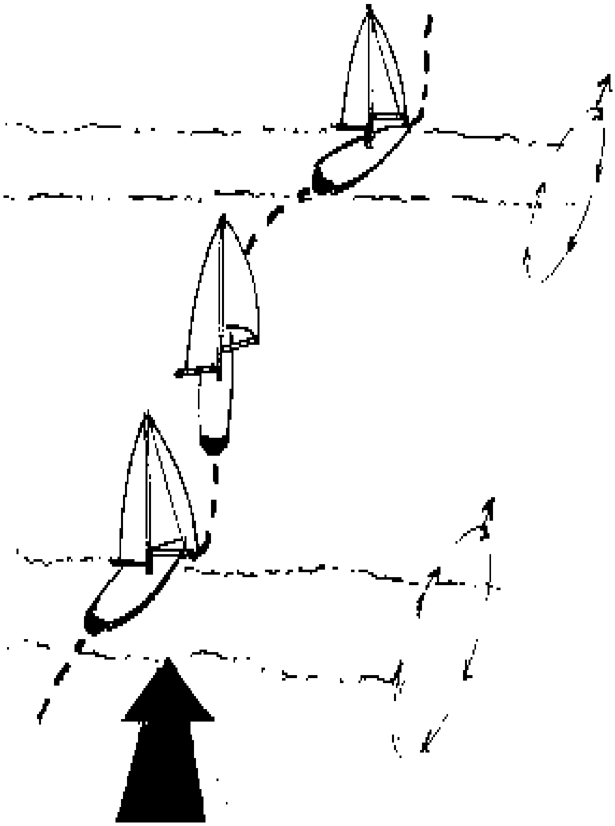
You deal with this the same way on a boat as on a surfboard. As you reach the bottom you "pull out," in other words, head up to weather and across the wave. The angle of course change is a function of steering control and wave shape. Usually a pull up of 30-degrees is more than enough. Sometimes 20-degrees will do the job.

At the same time this is happening you are also positioning yourself for the next wave.

"Carving" waves, as this is known, is loads of fun. In fact, on a long passage, hand steering while you are surfing like this is one of the best reasons I can think of for making a passage in the first place.

But after awhile you get tired of steering and want to return helming to the autopilot or windvane. What do you do now?

Obviously the self-steering device is not going to be able to finesse the waves in the same way you can. So, you need to pick a course which has enough angle to the wind to generate the power required to get you surfing down the wave, but not so much that the boat heads up out of control as it accelerates across the face.



The fastest course downwind depends on the wind, sea state, and boat's characteristics. Ideally, you head up on the back side of the wave to accelerate. Then, as you begin to catch the face of the wave, turn the bow down to leeward. Once you are in the trough, as soon as the boat begins to slow, start heading back to windward.

This is a question of trial and error. Sometimes you have to head off deeper, which causes you to miss a lot of waves, because steering a higher angle is too difficult for the self-steering system.

Helming Technique in Heavy Boats

As the boat gets heavier and/or your steering control is not up to the task the issue becomes staying comfortable and avoiding wild changes in course at the bottom of the wave.

Rather than heading up to get started as a crest approaches, you will be steering more or less straight downwind, or on a very broad reach.

In almost all cases you will continue this course down the wave face and at the bottom your speed will drop precipitously until the next wave comes along.

The key here is not to lose steering control, or have it get too sluggish because of slowing down at the bottom.

If you do slow down excessively in the trough, it may be helpful to head up to weather a bit to get the boat moving—not so much to catch the next wave as to establish good rudder control.

When It Is Time to Reef

How do you define a strong blow, a gale, a storm? It is very much a question of your previous experience and anxiety level. As your experience with weather goes up, your anxiety goes down. It isn't long before conditions you once thought of as a gale have been reduced to a fresh breeze.

Sometimes one's anxiety or tiredness makes it difficult to take action.We've certainly had more than one passage where we'd be thinking we ought to shorten sail, but didn't want to get wet in the process.

Then after arguing with ourselves for awhile we'd inevitably pull on our foul weather gear and get the job done—and then wonder what all the fuss had been about.

Keep in mind that once the wind starts to blow you can make very nice, comfortable progress with much-reduced sail. Where you might be doing seven knots on a reach, really pressing hard, if you reef down and put up a staysail, heel might be cut in half, while speed would drop perhaps a quarter of a knot.

When the breeze really makes up it is almost always better to reduce sail early rather than later.

Reefing the Main

If you are properly set up with slab reefing, and are familiar with your system, you should be able to put a reef in the mainsail in less than five minutes. A little preparation in advance will help the process.

Reaching along in fresh tradewinds this yawl has taken a quick tuck in the mainsail. While changing headsails is always a pain, she would be more efficient if she were flying a smaller, higher clewed jib and full main on this range of sail.

First, the halyard should be marked relative to the halyard winch or jammer, for each reef position. Magic Marker works well (but needs to be updated periodically). Next, you will want some form of downhaul system set up which allows you to winch the sail down if you are broad reaching or running in really strong conditions.

Assuming these two issues have been dealt with before you leave port the process is then pretty straightforward.

Flake out the main halyard so it is free to run out the required distance. Have the line to the reef clew around a winch and ready to go.

Help

Ease off the halyard to the reef mark, and then crank in the clew as fast as possible.

When it is blowing really hard or when the sail tends to flog (this was more of a problem in the old days, before full battens, in anything over 18-knots of wind) we ease the halyard and take in on the clew reef line *at the same time*. This helps keep the leech under control. After the clew reef line is secure and the halyard is cleated, we work down the luff and tighten it.

If we expect to be reefed for a short period, we frequently will not bother tying in the reef cringles but pull the mainsail over the boom to windward and simply let wind pressure hold it in position. You must be sure, however, that there are no rough spots on the boom to chafe the sail. If a sea is running the sail should be tied up; otherwise a large amount of water may collect in the mainsail folds, overstressing the leech.

Does it make sense to shorten down early? Or are you better off waiting until you are forced? This is very much a function of the condition of your sails, and your own predilection. We used to wait until forced. Now we shorten down ahead of the weather.

In the photo alongside Watercolor is getting ready to head back to Oregon from Hanalei on the north coast of Kauai, in the Hawaiian Islands. While the bay is calm, they were not sure of what the trades were doing outside. It is always easy to shake out the reef if you need more sail!

By far the most common repair at sail lofts is mainsails which have been ripped when their clew reefing lines broke or loosened, putting load on the reef cringles. The best system is to use a really strong clew reef line, and then ease it periodically so it does not chafe in the same spot. On long passages we tie off a safety line through the clew (inset and arrow). This photo was taken at the end of our circumnavigation in 1983.

Help

When you are snuggled down for a long pull, it's a good idea to tie a safety line through the clew and then ease the actual reefing line to reduce the chances of its chafing through (something it is prone to do).

If the reef line does chafe through, and the cringles are tied, the odds are you will have a tear right through the cringles. This type of damage is the biggest single repair seen by sail lofts.

Sail Slides or Bolt Rope?

Most cruising sails are attached to the mast with sail slides. These stack up along the track when you are reefing, keeping the luff in place and generally making your job a lot easier.

But if you have a "performance" mainsail, with a bolt rope for connection to the mast, the sail will drop away from the spar as it is lowered. This leaves you with a large drape of sail cloth at the luff with which you must wrestle.

Most mains with bolt ropes connect their reef tack points to the boom by means of a hook or strap. This works fine with a few sets of extra hands aboard and in moderate weather. But if you are working the mast by yourself, and/or it is blowing really hard, a continuous downhaul will give you much better control.

If you have a bolt rope it is probably better to deal with the luff of the mainsail first, before tightening the clew line. This reduces the risk of the bolt rope tearing free of the mast. It also helps sometimes to ease the outhaul (or flattening reef) before starting to ease the halyard.

Watch that Boom

As you ease the halyard the boom weight goes onto the topping lift. You will want to make sure it is snugged down and adjusted so the boom doesn't drop onto something (if you've got a mechanical vang this will not be an issue).

With a conventionally battened sail and a stiff breeze the boom will probably be oscillating through a large arc. Be sure you and the crew keep well clear.

As the wind increases a jib rolled on the headstay creates a huge amount of windage. The cross section that the wind affects is the diameter of the rolled sail plus the arc it is gyrating through as the headstay wobbles back and forth. To reduce windage the jib should be rolled tightly, and backstay taken up to minimize headstay sag and wobble.

In addition, in heavy weather (or when leaving the boat for extended periods) secure the tack of the jib to a stanchion or cleat so the sail cannot accidentally unroll.

Sail Ties

One general rule holds, regardless of which sail you are changing: Always have lots of ties handy. We make a habit of festooning our lifelines with 6-foot (1.8-meter) pieces of webbing and 1/4-inch (6-millimeter) line. At times hundreds seem to be available, and at others, they seem to be all in use. Hanks and halyard shackles must be free and easy to operate, too.

Roller Reefing Jibs

All of the modern roller-furling systems advertise that you can reef your jib underway. Yes, they will roll up the sail, and they may even handle the load, but what about the sail shape?

There is no escaping the fact that roller-furled sails typically have a terrible shape after a reduction of more than 10-percent. They tend to have stress lines, and become very full.

This is okay if you are broad reaching, but close reaching or beating that full jib is going to heel you way over, load up the keel (just when it is trying to deal with big seas) while the sail rapidly deteriorates structurally.

Over the years we've asked sailmakers dozens of times for photos showing roller reefed headsails in a strong breeze. We still have not received any. However, the technology may be changing as you can see by the photos nearby. Stay tuned.

Dan Neri and family sailing Calvin on the lee side of Dominica in the West Indies. Dan is one of the most successful sailmakers in the world and a top racing hand—so when you see him roller reefing his jib there is something to be learned. In this case a new system developed at North Sails, utilizing rope for luff padding, is the key. Although this jib looks far from perfect, it is the best looking roller-reefed jib we've seen to date.

Fully Battened Mains

With more and more yachts being fitted with fully battened mainsails we probably ought to take a few minutes and talk about handling procedures.

Hardware Considerations

Batten hardware tends to see a lot of reverse cycle loading which is hard on connection points and fasteners. So, it is a good idea to give a close inspection to the batten hardware as you are raising the sail.

Minimizing friction is, of course, paramount. Dirty, or dry tracks make it much more difficult to raise and lower the sail. We usually go aloft and spray our tracks once every couple of months with a teflon lubricant.

In between trips aloft, we'll give a short squirt to the hardware before hoisting every couple of weeks.

Hoisting

We set up our lazy jacks so they are always in place (rather than pulling them forward when hoisting). This keeps the sail neatly on the boom after the gaskets have been removed.

As a result of this, we need to raise the head of the sail with care until the battens are clear of the lazy jacks. On our sails this usually means about 20-percent of the luff length.

Since this is the easy part of the hoists we usually stand by the middle of the boom, and pull on the halyard with one hand while guiding (if necessary) the first couple of battens between the lazy jacks.

Once the leech is free, we use the winch (nowadays an electric winch) and ignore the leech.

Being feathered into the wind reduces the angle of the sail to the mast and makes it much easier to raise.

If you happen to be using an electric winch, the winch should not be straining, and should not slow down significantly during the last half of the hoist. If it does, there is excess friction and something needs to be cleaned, lubricated, or repaired.

Never allow the winch to force the mainsail up. When in doubt, drop the sail and find the cause of the increased friction.

Sailing with a Fully Battened Mainsail

Once underway you'll notice that the sail maintains its shape better in sloppy conditions. You'll be able to crank more draft in with the leech cord, and the sail will be somewhat more responsive to mast bend shape control.

Keep a close eye on your telltales, being especially careful of overtrimming. Remember that you won't see a luff in the sail cloth until the sail is heavily backwinded.

Try easing the sheet in puffs and watching the feathering action. In a stiff breeze, when you're overpowered, the sail should sit quietly, occa-

Help

sionally undulating. Chatter and commotion should be mostly absent. If not, try stiffer battens.

One negative with the full battens can come when you are being pressed hard downwind. With battens and sail forced against the shrouds, spreaders, and aft face of the mast, there is more resistance to getting the sail lowered if you are trying to reef. It's a good idea to rig a control line from the headboard down to the deck so that you can winch the sail down in this situation.

Finally, a word about chafe. A lot of folks have a problem with this on long downwind passages. Our own experience, however, is that if you are properly set up there is no difference between a fully battened and conventional mainsail.

It is worth reiterating that the key in dealing with the chafe issues is to specify UHMW plastic chafe strips on all battens where they intersect with shrouds (see page 26). We use solid fiberglass battens to reduce breakage. Finally, you need to make sure that there is sufficient distance between the batten and aft edge of the mast so that the batten hardware does not chafe against the aluminum trailing edge when running.

Using full length battens in boomed sails offers huge advantages in terms of sail handling (they are easier to hoist and lower), control of sail shape, and longevity.

This is true for big boats and small, single stickers and split rigs, and sails with conventional roach profiles as well as those which are more aggressive.

Wakaroa, the Deerfoot 72 above, saw significant boat speed gains with less heel when she switched to her fully battened main and mizzen.

Dropping the Main

Lowering the sail is a matter of snugging the lazy jacks by hand, then tightening them using the vang or sheet to pull the boom down. Ease the halyard (rather than letting it drop) and give a tug on the sail stack now and then to make things compact.

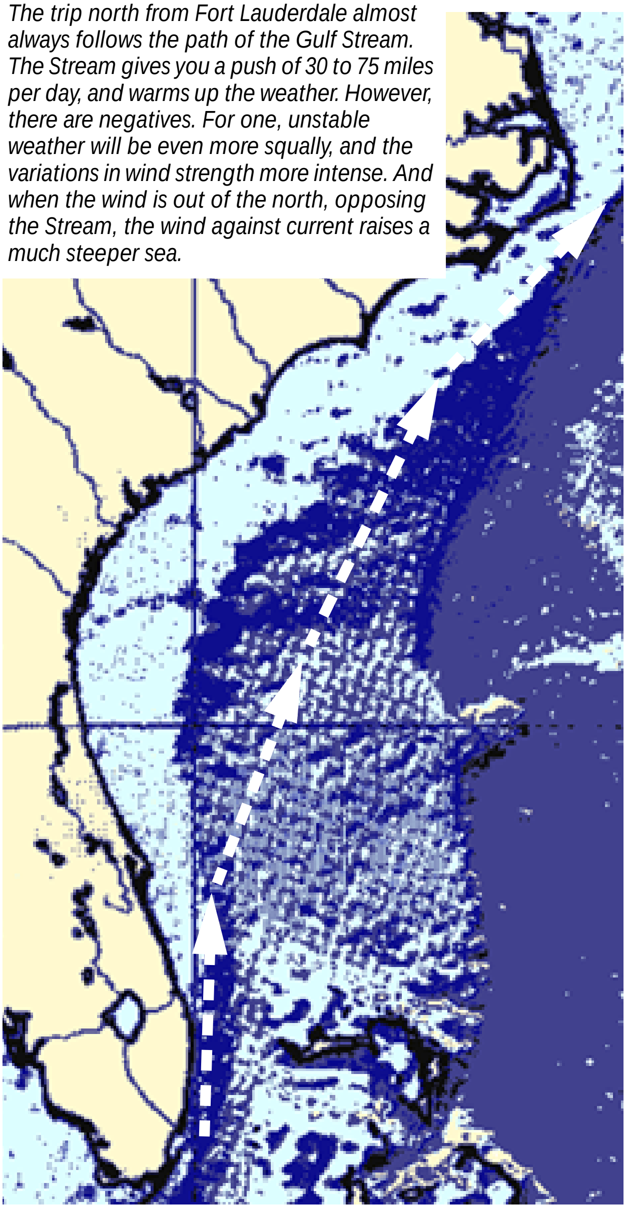
When the sail is new it will stack up due to stiffness of the sail cloth. But once it has been used a couple of times it will flake in a much smaller volume.

If you are not directly feathered into the wind when dropping the sail, ease the sheet so the boom can align itself with the wind.

Being Comfortable at Sea

So far we've discussed all sorts of sail combinations, different types of trim and a variety of other options for making the boat go fast. What we need to get into next is how you put this to work to make your passage comfortable.

Join us aboard *Intermezzo II* on a dark and squally night as she blasts her way north towards New England. We've just left Fort Lauderdale, Florida. The east-northeast wind and Gulf Stream seas set the tempo as her powerful hull moves along at just under 10 knots. She and I are in our element: a hard-driving reach. But below the crew is rebelling.



The trip north from Fort Lauderdale almost always follows the path of the Gulf Stream. The Stream gives you a push of 30 to 75 miles per day, and warms up the weather. However, there are negatives. For one, unstable weather will be even more squally, and the variations in wind strength more intense. And when the wind is out of the north, opposing the Stream, the wind against current raises a much steeper sea.

Nobletec Charts

It's a familiar scenario on many cruising yachts. Excited to be away from the dock, the skipper revels in a strong breeze. The distaff side of the crew, on the other hand, prefers a more peaceful passage.

Mournfully I look at the steam gauge swinging between 9.5 and 10.2 knots. Today is the first good sail we have had in months. But Linda doesn't care that our 62-foot (19-meter) express is comparatively stable, seakindly, and comfortable. "If we were out here in the old *Intermezzo*," I say, "not only would we not be going anywhere, we would be getting creamed."

Masculine seagoing logic fails. Linda refuses to bite the apple. Behind those steeling hazel eyes, I see a vision of a house and garden on stable land. It is time for action. With a sigh I put a reef in the main.

"There, there," she says solicitously. "That isn't so bad, is it?"

Do Not Overpower

Intermezzo II is sailing comfortably on her feet and her speed has dropped only 0.3 knot. I am forced to agree.

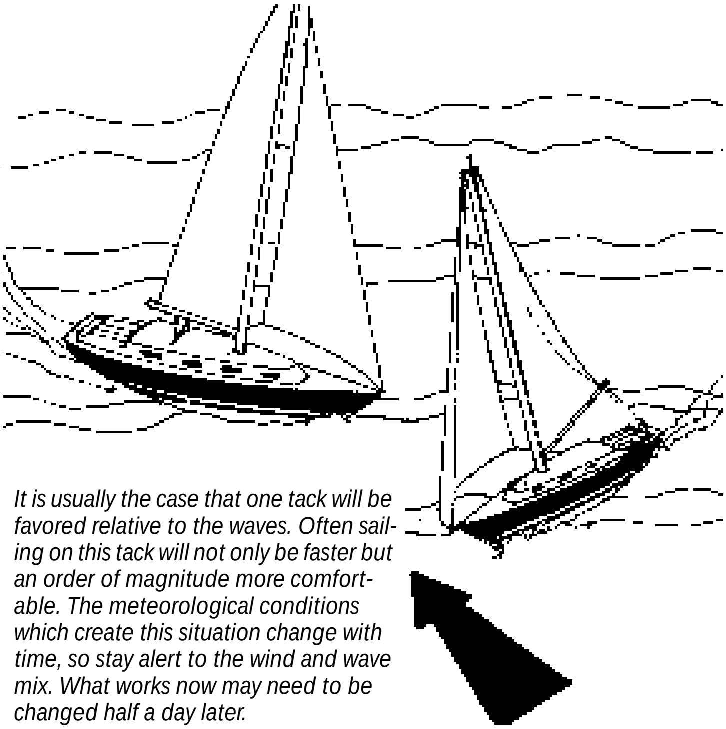
Help

This example illustrates a lesson in seagoing comfort we have learned over and over. There is an optimum balance between speed and comfort for any given occasion. Into this equation must be factored the vessel's sailing characteristics, the wind, and sea conditions. There are no hard and fast rules, but some of our experiences may help in your own experiments to achieve greater seagoing comfort at only a modest cost in distance made good to windward.

Going to Windward

Going to windward you have two basic approaches to improving comfort. Reducing sail, and thus the angle of heel, is often the most successful. If the seas are up, slowing boat speed will reduce pounding. Another approach is to vary your angle of attack to the seas. The further off the wind you sail, the more you reduce pounding, and the more upright the boat sails, allowing a greater spread of sail and turn of speed for a given level of comfort. Often one tack will be more favorable in an existing sea state as the waves are frequently skewed 15- to 30-degrees from wind direction.

It is two days later as *Intermezzo II* approaches Cape Hatteras. The wind has gone to the north and is gusting into the forties, and we are slamming forward under deeply reefed main and heavy staysail. The steep seas opposing the Gulf Stream are now making this passage an endurance contest for all aboard.



It is usually the case that one tack will be favored relative to the waves. Often sailing on this tack will not only be faster but an order of magnitude more comfortable. The meteorological conditions which create this situation change with time, so stay alert to the wind and wave mix. What works now may need to be changed half a day later.

Help

Pinching Up

The wind is coming to us courtesy of a stationary high-pressure system. Continual changes in velocity make it impossible to adjust the sail we are carrying to suit conditions perfectly. To make the best of the norther, we adopt the tactic of pinching up in the heaviest puffs and largest sets of seas and then falling off to a better sailing angle in the lulls or when the seas moderate.

We often find that this technique, sailing a little too close to the wind, works well when we are temporarily overpowered or made uncomfortable by the seas. On the other hand, in very short, steep seas, falling off and reducing speed by shortening sail can be the more comfortable solution. And if you have time and sea room, it may be better simply to heave to for awhile, giving the weather a chance to abate before you continue.

In our case, however, we have to be in Annapolis in two days, so there isn't time to wait out the weather, even if we were so inclined. But to add insult to injury, 24 hours later as we enter the mouth of the Chesapeake Bay the wind goes light and into the east. If we had taken our own advice, and hove to for a day, we'd have been here almost as fast, with far less wear and tear on the crew.

Downwind Comfort

Off the wind the situation is more interesting. Discomfort arises from a number of factors not at work on the upwind course. Athwartship rolling is the worst. Next is careening about on the faces of the waves as they sweep underneath the hull. The appropriate remedies will depend on the type of vessel, her self-steering abilities, the stability of wind direction and velocity, and sea conditions.

Picking the Best Speed

The most important ingredient in the equation is self-steering, especially at surfing speeds. On modern yachts with fin keels and spade rudders and powerful self-steering systems, you may be able to *add* sail to reduce motion. While this may sound like a paradox, it is manifestly true. Adding sail and speed frequently helps combat rolling. Dynamic stability is conferred by the increased speed, and the boat's steering gear can better cope with the waves. The same principle that keeps a gyroscope spinning in place helps keep you stable.

It is 0600, and Linda has just informed me it's my watch. With a groan, I pry myself from the saloon cushion. We have been reaching towards Panama for the past two days in strong southeasterly winds. The Force 5 to Force 6 breeze has us at speed, and we have put 443 miles behind us in the last 48 hours.

Reducing Yaw Downwind

But now the wind has shifted to the east, maybe even a little north of east. Our speed is still good, but *Intermezzo II*'s motion has increased as the wind pressure on the sails has eased. There is a chance to carry the

Help

yankee on the spinnaker pole. I decide to experiment. The slack jibsheet is led through the end of the pole, and the pole is hoisted into position and secured. I run off square, allowing the big yankee to collapse in the lee of the mainsail. Quickly I haul it through the forward triangle and with a last effort sheet it home. I adjust the autopilot back to 210 degrees, and we are once again flying, only this time minus a lot of motion.

By winging out the yankee I have accomplished two things: first, the sail is drawing more efficiently, giving us better boat-speed. Second, its new position reduces the boat's tendency to yaw up to windward as the seas rush under our stern.

The sail from the Windward Passage (between Haiti and Cuba) to Panama is usually fast, and unfortunately rolly. There is often a sea from the northeast and southeast, more or less crossing at right angles. Often changing course in one direction or the other, sometimes as little as 15-degrees, can make the ride much smoother. Then, when the sea state changes, you can come back on course.

In a Leftover Sea

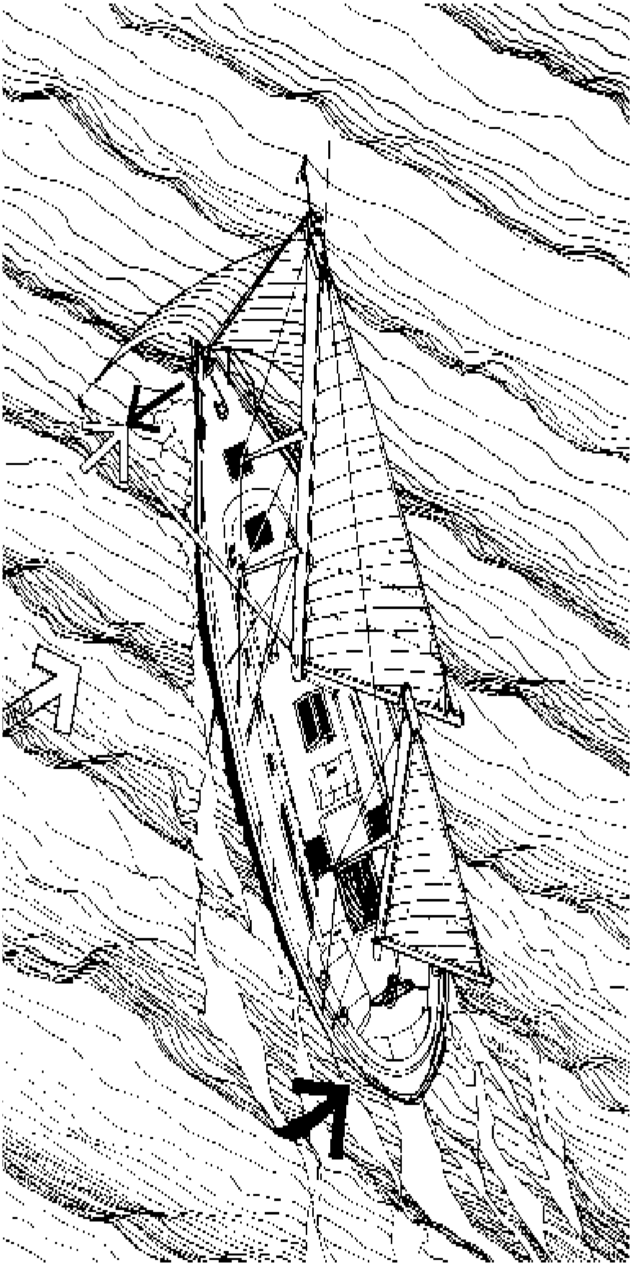
Later that afternoon, Panama is only 24 hours away at our present rate of speed. We are looking forward to transiting the canal. The wind begins to drop a bit and continues to back until it is nearly square off the stern. *Intermezzo II* is clearly unhappy and swings back and forth on the leftover seas—a most uncomfortable way to travel.

The solution to the problem lies once again in sail area. With the yankee still poled out to windward, we hoist the single-luff (cruising) spinnaker to leeward. The main is still reefed from our earlier reaching, so the spinnaker fills well, and our speed jumps a full 1.5 knots. More important, our motion settles down. Even Linda comments favorably, despite our now averaging better than 11.5 knots!

Oversheeting to Reduce Rolling

Older designs, those yachts with heavier displacement and keel-hung rudders, may not be able to handle the steering loads that come with the high downwind speed and surfing. On these boats, carrying a staysail or sheeting a reefed main close to the centerline will reduce rolling.

Help

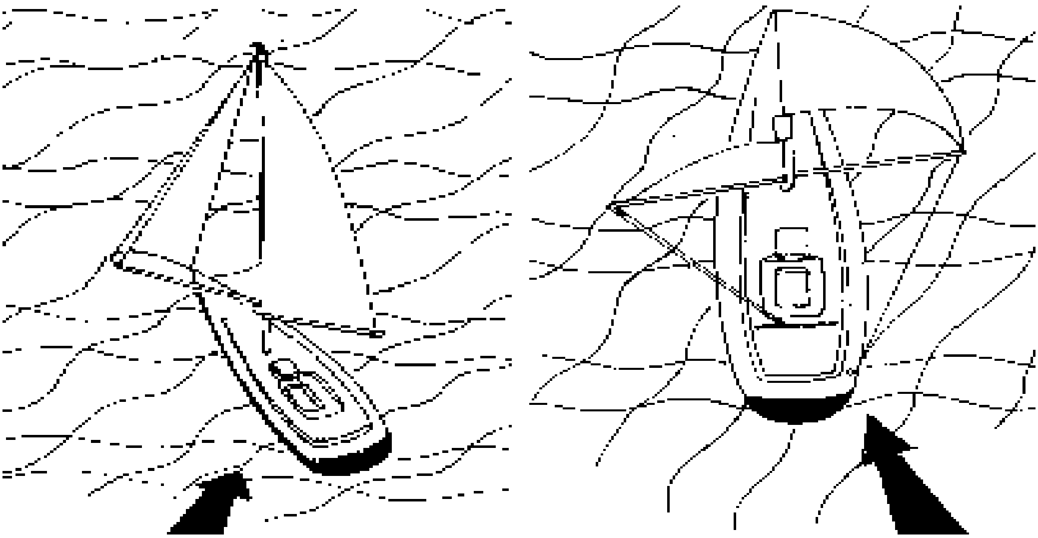


It is often better to carry more sail area rather than less downwind. The increased speed can lead to better steering response, and fewer waves overtaking the boat. In the drawing above, the ketch depicted is carrying both boomed sails and twin headsails, and sailing at a 40-degree angle to the seas. She can do this comfortably in moderate winds. But when the breeze picks up, there may be problems keeping her on course—at which point the crew will want to reduce sail, or head further off the wind.

You should avoid running absolutely square if possible. Tacking downwind, the alternative, allows the apparent wind to come forward and build, which in turn reduces motion. Sometimes as little as 10-degrees up from a dead run will do the trick. And as we've mentioned previously, most yachts actually move faster enough to more than compensate for the increased distance being traveled.

Picking a Comfortable Course

As the seas and wind go more on the quarter, the self-steering system starts to work harder. At the point where it no longer adequately controls the vessel, the quartering seas or wind puffs will start rounding the boat up. The boat heels, the sails luff violently, and the crew may even have to assist the self-steering to get back on the course. Here you have two choices. You can pick a course slightly more to leeward. (Even if your direct course is higher you may want to fall off, hoping for a freeing windshift later on. Or take a last short hitch closer on the wind to compensate). This change in angle may be just enough to keep the wind or wave faces from overpowering the steering. If the boat still tends to round up, you will have to reduce sail. Try reducing the mizzen or mainsail area before changing down the headsails. It helps steering to keep the center of effort forward in the rig. Our own experience is



that on long downwind passages, sail and course angle combinations have to be varied frequently in response to the changing wind and sea conditions.

Increasing or decreasing sail area to meet changing wind and sea conditions could well be all you'll need to do to keep your boat comfortable at sea. Being flexible in your sailing angle if you have the sea room may make matters even better; slight changes in course can make life aboard much more pleasant. (Don't be surprised if course changes need to be made frequently). And finally, be willing to experiment. The potential combinations of wind, sea, and course are endless. There is almost always a better way (note: once you get through the weather section you will find a much more detailed look at passage routing and picking the best course options for your type of cruising).

Light and Sloppy

I've left the worst for last. You will eventually encounter light airs and a left-over sea (generally from several directions at once), much larger than the current wind conditions would generate. And the odds are that this is going to happen when you are headed downwind.

The boat is going to be rolling back and forth, the sails collapse and then fill with a bang, meanwhile everything attached to the rig shakes and crashes until you wonder how it will ever stand up to the shaking. (In the days of commercial sail a full-rigged ship could literally dismast herself in these conditions, so the crews would hoist balls of chain into the rigging to add to the ship's momentum and reduce the period of oscillation.)

You can usually alter course closer to the wind so the breeze steadies down the motion. Of course this takes you away from your intended destination. It may be worth heaving to until the sea lays down or the breeze picks up.

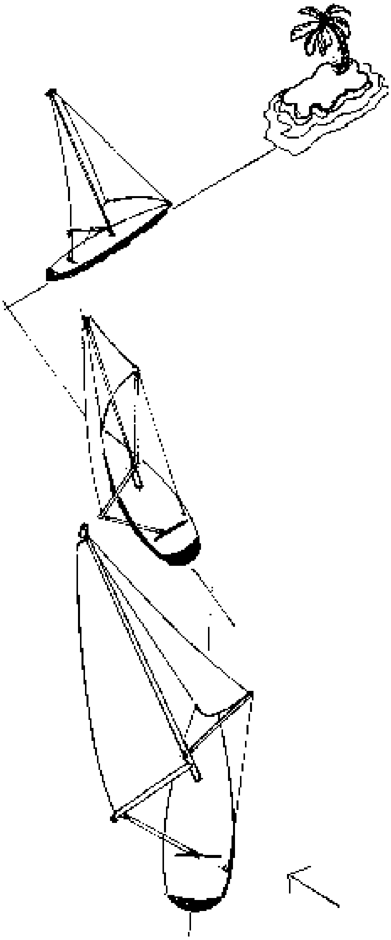
When there is a crossing sea the comfort issue gets more complicated. Ideally, you will find a course and boat speed mixture which allows the boat to pick her way between the intervening swells and waves. In the right drawing the primary wind waves are dead behind the boat while a secondary system catches her on the quarter. As long as the secondary swell isn't too large, she can get away with this course. At some point, however, she will be much more comfortable on the opposite jibe, with the secondary swell more on the stern.

In the left drawing the boat has jibed. Note that more of the seas are now on the stern. While this may not be the optimal navigational course, it will be the most comfortable.

Assuming you have navigational room to vary your course, it often makes sense to adjust to what the wind and wave will allow you to take comfortably. Sometimes this means choosing an alternate destination or heaving to for awhile as we've already discussed. At other times, especially when sailing downwind on a reaching leg, it may pay to sag off to leeward, as shown in the drawing beside, and then head back up when conditions allow it in a comfortable fashion.

This works best when you are reasonably certain of a favorable trend in the wind. In the case shown here, you would be banking on a reduction in wind strength and/or the dying away of an uncomfortable secondary swell system.

If you adopted these tactics and the breeze increased, the last leg of the passage, sailing on a beam reach, might be really uncomfortable.



Another approach is to center the mainsail (sheeted down hard) while flying a jib on the pole (or twin jibs—spinnakers usually won't stay filled in these conditions).

If the sail still crashes back and forth even though it is centered you may want to drop it entirely.

Or, if you have the capability, lighting up the engine and motorsailing frequently brings with it a calming relief from rolling.

Motorsailing

We have never been bashful about using the engine if we thought it would significantly shorten our passage time or make our life more comfortable. This has been especially true in areas with potentially difficult weather, when we wanted to get past a certain point in the shortest possible time.

Fortunately, most sailboats with auxiliary engines do a pretty good job of motorsailing. Take a few horsepower from the engine and use that to get the boat settled down and some apparent wind moving over the rig, and you can travel a surprisingly long way for very small amounts of diesel fuel.

Range under Power

In order to efficiently plan the best use of motorsailing and/or pure motoring one needs a good handle on fuel consumption per hour at various speeds and wind angles. This is best done by experimentation in a variety of conditions, adding to the data base as time goes on (this subject is covered in great detail starting on page 764 of *Offshore Cruising Encyclopedia*).

The key thing to understand is the relationship between speed and range. As speed goes up, range goes down, typically in a geometric fashion as speed increases above 1.1 times the square root of the waterline length.

Help

Downwind Motorsailing

Any time your destination is dead downwind, unless there is a nice breeze blowing, progress is going to be very slow (and hot if you're in the tropics). On the other hand, if you crank up the engine, trim in the sails a bit, and head up on course by 15-degrees or so, you will be able to motorsail along at a very good clip for modest fuel consumption at low rpms.

If the boat has been rocking around in a leftover sea, as we've just discussed in the last section, you will probably find that she settles right down with the application of a little power.

Keep an eye for wind on the water, however. Once you get moving with engine and sails it is often easy to miss a build-up of breeze that would enable you to sail without the engine.

Upwind Motorsailing in Light Airs

Beating to windward is fine for day sailing or in a race, but on a passage where the issue is getting there as quickly as possible, with minimum effort and discomfort, the engine becomes the most efficient way to go uphill, providing you have a reliable source of power and an efficient propeller.

It is also usually less expensive to run the engine than to pay for wear and tear on your rig and sails.

If your course is dead upwind, bring the main traveler to windward a couple of feet (600 milli-

Two approaches to motorsailing. Above, using a reefed main in light airs to stabilize the boat. There is a small amount of drive being derived from the main above, but it is a close call. If you don't have 15- to 18-degrees of apparent wind, the form drag of the sail will really slow the boat down.

Below the main is driving right along at about 30-degrees apparent. In this manner the main will generate as much as half the power required to move the boat forward.

meters), and move the leech of the main right to the centerline.

You will find that you need around 12- to 15-degrees of apparent wind angle to get the best combination of drive out of the mainsail and engine.

The main should be moderately flat in these conditions.

The most efficient powering speeds, the point where the longest range is achieved, is typically at a speed at or just under the square root of the waterline length. As an example, for a 36 foot (11.3 meter) waterline this would be right around six knots.

Upwind Motorsailing in Heavy Conditions

As the winds and seas increase your approach to upwind motorsailing will change. The traveler may still be to weather if you're trying to sail close to the eye of the wind.

The main should be board flat. Even a slight increase in sail draft will reduce speed and increase heel by substantial amounts.

You will want just enough main to keep the boat at a 10- to 15-degree heel. Any more is uncomfortable and counterproductive. Rather than easing the traveler down and heading off with a feathered main, it is better to pop in a reef or two if conditions warrant.

Special Considerations

The common maximum operational heel angle for most diesel engines is 30-degrees constant heel and 40-degrees intermittent heel angle (verify your engine's limits in your engine or owner's manual). Exceeding this creates problems with oil pick-up in the pan.

Motorsailing check list:

- ❑ Fuel tanks and fuel filters clean.
- ❑ Prop clean.
- ❑ No lines in the water.
- ❑ Engine oil topped off.
- ❑ Watch maximum heel angle for continuous engine operation (check owner's manual).
- ❑ If prop cavitation occurs back off on rpms.

Keep an eye on both oil pressure (which will drop at excessive heel angles) and the heel angle itself.

As the seas build you will want to experiment with your angle to them and the speed you maintain. There are no hard-and-fast rules, and in any given period you will probably find that speed and angle need to be changed from time to time for best results.

The boat will generally let you know very quickly whether or not it is happy.

There will frequently be a favored tack, where the waves have less impact. Often it is better to stay on this favored tack, even if it is not on the rhumb line, until the sea state moderates.

Sometimes speeding up will have a better effect on motion than slowing down. But the only way to know for sure is to experiment.

Prop Cavitation

Under some speed and sea combinations the prop may tend to cavitate. This is caused by the prop picking up air from the wave turbulence as the hull works through the waves. If you are powering along and feel occasional bursts of vibration, you will need to change speed and wave impact angle until the vibration stops.

Running Rigging in the Prop

Also keep an eye on loose sheets and halyards. If one of these gets over the side, it is eventually going to find its way to the propeller, stop the engine, and force you to either become a true sailboat or go for a swim. Better to keep these lines secure on deck!

Sailing in Tight Quarters

The sailing we did before we got serious about cruising was without the benefit of an engine. For years we sailed in and out of all sorts of nooks and crannies, never really thinking about how we were disadvantaged by the lack of power. Of course, when the wind was light and we sat around waiting for the next zephyr we were frustrated, but using an engine to get from here to there was never really part of the picture.

Then we acquired *Intermezzo* and her trusty Isuzu diesel. At the turn of a key we could go when the wind wouldn't blow. We could power dead to windward and could anchor in tight corners we would never have considered when we knew we had to sail out. Quickly we slipped into the role of *auxiliary* sailors. Whenever sailing required more than a small effort, on would go the engine.

One Saturday, several months after this transformation, we were approaching Emerald Bay on California's Catalina Island. It's a quiet anchorage nestled against the barren landscape and has clear water, an islet, and invariably lots of moored boats.

"Let's sail the hook in," I suggested to Linda.

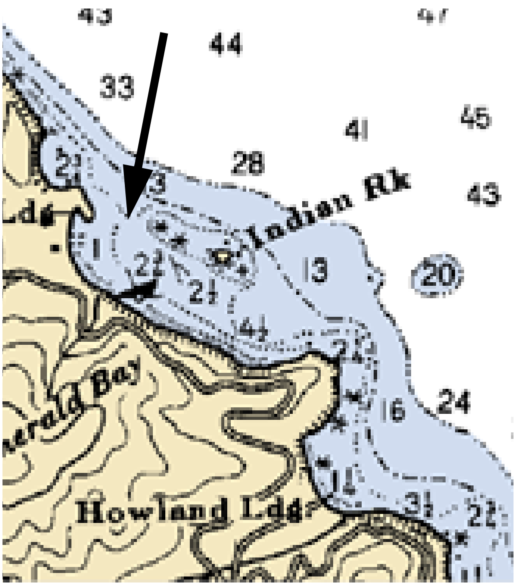
"With all these boats here?" She looked aghast. That we had sailed in and out of much tighter spots for years she seemed to have forgotten. But I was up for a bit of showing off.

We decided to use the same basic procedures we had used on our engineless boats. In the light air, with the main anchor at the ready, we would slowly make our way downwind. I would signal to Linda to let the hook go, and our forward momentum would be used to set the anchor.

We readied our large, high-tensile Danforth, which we knew would bite immediately in the hard sand bottom of Emerald Bay. We worked our way upwind, dropped the main and furled the working jib, and used our small mizzen to power us downwind. *Intermezzo*'s speed dropped to 2 knots, just enough for steerage and momentum to round up, get the roller-furling jib set, and beat out if a problem occurred.

"Let go!" I yelled forward.

With a splash the anchor was down, the rattle of running chain resounding throughout the bay. At the 200-foot mark, Linda dogged the winch. A moment later, before the chain snubbed tight, I put *Intermezzo*'s helm hard over. Quickly I tossed the stern hook over and sheeted home the mizzen. She rounded



Emerald Bay is one of the prettiest coves on Catalina Island, off the coast of Southern California. It is filled with moored boats on weekends. The arrow indicates where we anchored with Intermezzo.

up quickly and within seconds we were lying docilely, head to wind, anchored bow and stern.

Linda put the windlass to work centering us between the two anchors. In a few minutes the operation was over, and we went about coiling lines, getting the dinghy ready, covering sails. No one in the anchorage even noticed! So much for showing off.

Despite the lack of audience appreciation, we realized we had just rediscovered a very satisfying aspect of cruising: maneuvering in tight quarters under sail. Until then we hadn't much thought about it one way or another. When our boats had no engine, there was no choice. With the diesel aboard *Intermezzo*, we found we always took the easy route. After our Emerald Bay rediscovery, whenever possible we sailed on and off the hook and regarded *Intermezzo* as engineless when it came to picking anchorages.

We ultimately decided that in most of our cruising the engine's primary importance lay in making hot water, producing electricity, and keeping the refrigerator cold. Whether the prop turned was secondary. By practicing with *Intermezzo* under sail in tight quarters and having the right headsails up, we learned we could take her almost anywhere under sail we would care to go under power.

When we did use the engine it was always with the assumption that something would go wrong. Halyards were left attached to furled sails, with sheets flaked at the ready in case we should have to sail out of somewhere our engine had taken us.

Our maneuvering successfully in tight quarters depended on a number of factors. First, we had to have an easy-to-handle rig. Large, overlapping genoas were left in the sail locker. Our intermediate forestay would need to be removable so we could tack the headsail quickly. Both bow and stern anchors, rodes, and chains were easy to operate and ready to go at a moment's notice. Finally, we were thoroughly familiar with *Intermezzo*'s quirks because we had practiced.

Two-and-a-half decades later, now with much larger yachts, we are still sailing on and off the anchor. We are more likely these days to use the engine on the passage, but we enjoy sailing into and out of tight spots.

Rig Configuration

When we acquired *Intermezzo* she wasn't really set up correctly for maneuvering in tight quarters.

Help

So, the first thing we did was to cut an old heavy #1 genoa down to a lapper. The clew came back only as far as the cap shrouds and there was little sheet to be trimmed when we tacked. This meant one of us could handle the sheets while the other prepared the ground tackle, or made ready to drop the sails. We then obtained a quick release lever for the intermediate forestay so it could be removed to allow the jib to sweep straight across the foredeck (if you have a fixed cutter stay and/or only large overlapping headsails sometimes you are better off using a staysail in tight quarters rather than a large jib).

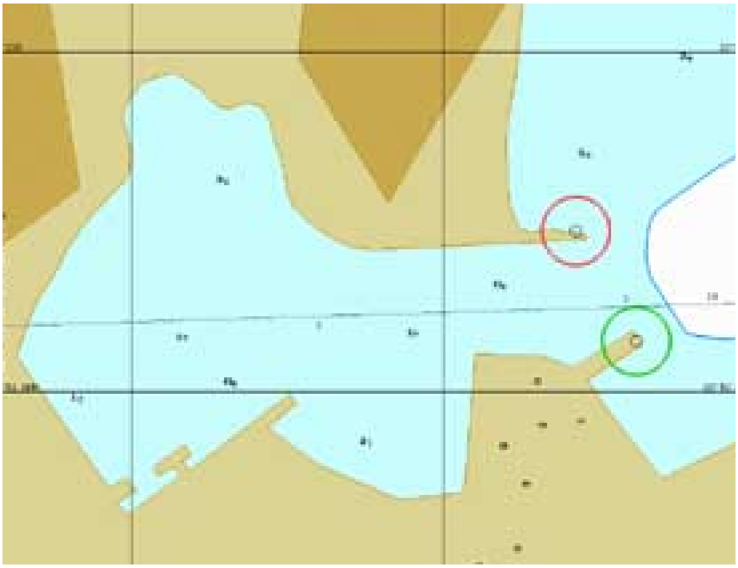
Cabo San Lucas

We had our first real-life test of this rig entering Cabo San Lucas at the tip of Baja California in Mexico. The pressure plate between the engine and transmission went out (although we didn't know that was the problem at the time), and the prop wouldn't turn.

The air was typically light, and we were using the greater part of our wardrobe to keep *Intermezzo* moving. As we approached Cabo we doused the nylon drifter and hoisted the working jib. The forestay was released and pulled back out of the way against the mast, and we proceeded to short-tack *Intermezzo* through the 100-foot (30-meter) wide harbor entrance. To help her tack and gather way more quickly in the light conditions we would hold the jib for a few seconds after her head came through the wind. This allowed the wind to blow the bow off. At the same time we let the main traveler down to leeward so the main didn't begin to draw on the new tack too early, eliminating its tendency to force the bow back into the wind and place us in irons. Once inside, we headed up, let the hook down, and settled back on our chain. We didn't have the luxury of sailing the anchor into a good set, but we knew the holding was fine and the harbor protected.

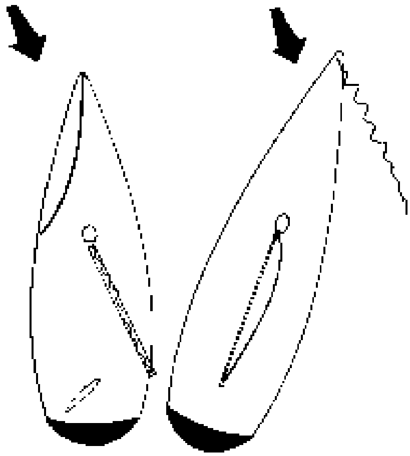
The inner harbor at Cabo San Lucas (below) is tiny, perhaps 725 feet (250 meters) across with an entrance less than 150 feet (40 meters) wide. The breeze tends to be steady during the afternoon, other times it is quite fickle. Sailing into and out of a harbor like this is certainly doable, but you need to have ground tackle ready to go in an instant, in case something goes wrong.

By this time Linda and I were familiar with the basic characteristics of *Intermezzo* under sail. We had learned how far she would carry forward after rounding up into the wind. If we wanted to break way quickly we would leave a main or jib up after coming head-to-wind. In light air the mainsail could be pushed to windward as a brake (a common technique in dinghy sailing).



Transas Chart

Help



Using Sails to Help Steer

We also understood how to trim the jib, main, and mizzen for turning ourselves into or away from the wind. If we wanted to head off quickly, we would let the mainsheet way out and sheet the jib in to push the bow around. Heading up required just the opposite moves; the main came in and the jib went out. The mizzen worked as an auxiliary rudder. Backing it pushed the stern to the opposite side, while sheeting amidships would bring us nicely head-to-wind. From our earlier experience in catamarans, we knew that if we were in irons while the jib was blowing the head off, we would make sternway. So the rudder would have to be turned opposite the bow, helping the head blow off so we would start sailing more quickly.

Next time you head out for a sail, practice using your sails to help turn the boat. You will find that your sails have as much effect on your ability to turn sharply as does the rudder.

(Left drawing) backing the jib and/or easing the main down on the traveler (or easing the main sheet) allows the head to fall off more quickly than if the main is centered.

If you ease the sheet and overtrim the mainsail (right drawing) the boat will turn more quickly into the wind.

Pre-Planning

When you start out sailing in the hook the odds are you will be doing it in a familiar anchorage. However, this will probably not always be the case.

Because things may be happening quickly in tight quarters it is a good idea to do a little pre-planning while there's lots of time.

It frequently makes sense to heave to, or tack back and forth outside of a new harbor while you study the lay of things. If you can take a look from the lower spreaders your view will be much better.

We like to note the state of the tide. Hopefully it will be on the rise so if we go aground we'll have only have to wait a short time for the tide to float us free. Tidal current data also has to be checked.

The chart needs to be studied, and any obstructions clearly marked. When there is a lot of information to absorb on the chart sometimes we'll take a highlighting pen and indicate key data.

The topography of the harbor needs to be studied to try to discern its influence on the wind and current. Are there tall buildings or a hill which will block or deflect the wind? It is frequently possible to read wind conditions on the water from some distance off.

Usually, there will be enough space to sail in, and if we don't like the conditions we can sail back out.

Anchors Ready

But if this is going to be a one-shot deal, we make sure the anchor is ready to run. If the anchor is on a rope rode, we have the rode flaked out on deck so there is no chance for a snag.

To be on the safe side we always have the main anchor off the bow roller and hanging down, ready to go in an instant. The stern anchor is ready to go as well.

Help

One of the factors that must go into the equation is bottom condition. How quickly will the anchor dig in and hold? With some bottoms and/or anchors, you may have to allow several boat lengths (or more) of space in which to drift back while the anchor skates along the bottom.

We try to avoid entering a lee shore harbor under sail. If we miss a tack, I don't want to have to worry about going up on the beach.

Fortunately most anchorages are open enough to sail into and out of easily. If we can't sail out handily, we think twice about going in even with the engine working; an anchor line could foul the prop, or the engine itself could suddenly quit and I like to be able to sail out if necessary.

Finally, when choosing the best spot to drop the hook look at the anchorage in the context of sailing *off* the hook. You will need enough room to drift back a ways after the anchor is off the bottom, then have the head pay off and accelerate before you can tack again.

Maneuvering under sail:

- ❑ To turn to leeward ease main and trim jib.
- ❑ To turn to windward ease jib and trim main.
- ❑ To get out of irons face aft and steer in reverse (with jib backed and main eased).

Working in Close to Land

When you're working under sail close to land, try to anticipate headers and lifts; they can be a great help. There are other aspects to consider when you sail in commercial harbors. Big ships, for example, create wind vacuums close by their topsides, especially on hot, light-air days when the heat of the ship will force the wind up and off the water.

The choice of sails also has to be carefully considered. In major harbors it is probably more dangerous to be undercanvassed than overpowered. You can always luff a bit to depower the rig temporarily. But if you're caught with insufficient sail, failing to make a tack can become dangerous. Experience has taught us that one level of sail area below what we consider optimum is enough to keep us moving in the lulls.

East London

A sigh of relief from all aboard signals our arrival between the stone breakwaters of East London on the southern coast of South Africa. After a hard beat in a southwesterly gale we now have only to find *Intermezzo* a berth for the night. With the transmission inoperative our mooring will be under sail.

East London is a commercial port situated on the outfall of a small river. Each side of the 1/2-mile-long harbor is lined with docks, warehouses, and shipping, all snugly laid out between the hills of the river valley. There is a 2-knot ebbing current as we work our way through the breakwater.

I go forward to free up our big Danforth anchor (in the alluvial mud of the harbor the CQR would take too long to set). I remove the safety lashing and kick the anchor over the bow roller.

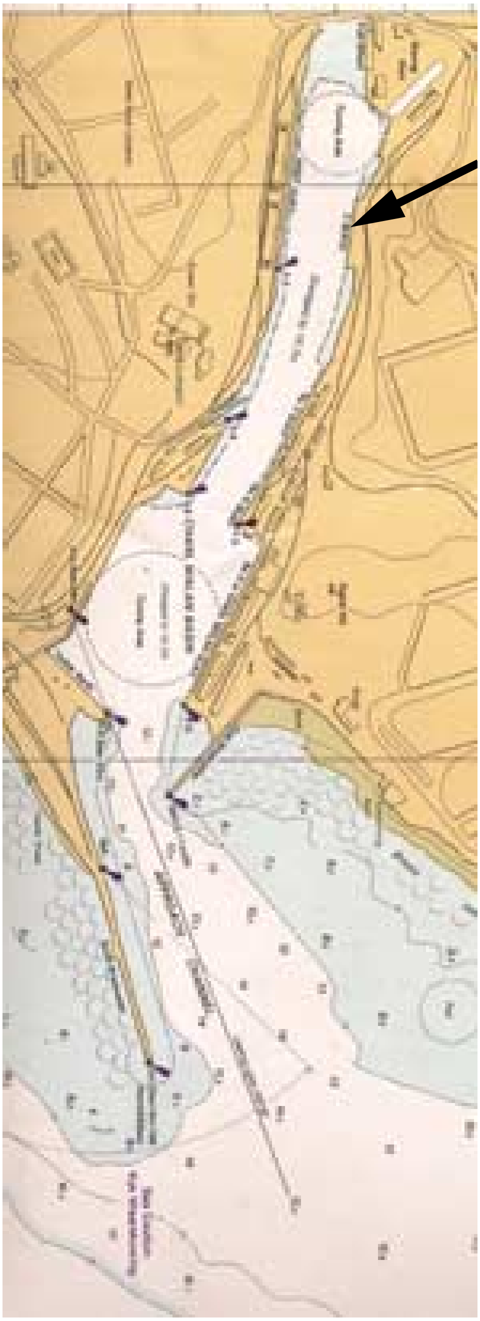
Linda also unties the Fortress aluminum stern hook, flakes the chain out, and spreads its 100 feet of line down the deck *Intermezzo* still carries her double-reefed main and storm staysail, as we expect any moment to have the full force of a gale descend upon us.

Anchoring under sail with current raises a series of specialized problems. If the current is flowing in the same direction as you are headed it will be more difficult to stop the boat. Current against you makes progress slower, but stopping the boat is easier.

Another consideration is dropping sails. Headsails can be rolled (or dropped) at almost any wind angle. But if the boat becomes current-bound between the anchor rode, wind, and current, the bow will likely lie at an angle to the wind making it difficult to drop the main and/or mizzen.

If this situation exists, it is best to sail in under headsail alone (if you have enough control this way).

Keep in mind that the load on the anchor and rode are likely to be much higher with current.



A detail of the harbor at East London. The ships were docked on the south (left) side of the harbor, as shown on the drawing on the opposite page. We ended up docked at the top of the harbor (black arrow).

The running backstays are both tightened up. That will eliminate one operation when tacking. The momentary chafe on the leeward side of the main is not a concern. Elyse is detailed to the leeward runner. If we must bear away quickly she will cast it off so the main can be eased out.

"Helm's alee!" I call out of habit as our nose comes up alongside the first freighter. Normally I would stay at least 100 feet (30 meters) away, but the harbor is so narrow we need all the room we can get on each tack. A momentary shift luffs the staysail just after we pass the eye of the wind. Then the breeze settles back. The staysail is sheeted home, and the main traveler is cranked back to windward. At 4-knots we glide forward. Four more times we repeat the procedure. The lulls and luffs alongside the ships are ever changing, but *Intermezzo* gains enough momentum between tacks to carry her through.

Linda goes to the bow as we make the top of the harbor where the river narrows and the channel is further restricted by a few moorings placed for local yachts. To starboard we see two of our friends from Durban, who have sought shelter from the same gale. We are invited to lie alongside them.

Because of the swiftly ebbing tide, I feel it is best to go up-current, drop the anchor and slide back to where we can toss them a line and warp ourselves alongside.

The harbor control launch comes by and asks if we would like a tow. The rough character of its topsides and the youthful appearance of the operator indicates we are probably better off left to our own devices. "No thanks," I reply, "but if you could retrieve our anchor after we have tied up, it would be great."

"Aye, we'll be happy to bring it back." they answer.

On port tack we ease the mainsheet to slow our way. Fifty yards upstream of our friends, *Intermezzo*'s speed drops to that of the current. Linda lets the Danforth go.

Quickly the mizzen is hoisted and backed to port. The stern swings to starboard and towards shore as we drift downriver on the ebb. When we're even with the other boats, Linda snubs the rode. I toss our stern spring the remaining 20 feet (six meters), and in a moment we are safe alongside. In spite of the dirty, industrial surroundings no port has ever been more welcome.

Using anchors to assist in docking is a time-honored procedure. If you're in unfamiliar surroundings, both the bow and stern hooks should be ready to go. On other occasions, sailing into a dock, we have used the stern hook as a brake. To do so, though, you need to gauge the water depth accurately, allow sufficient scope for the hook to bite immediately, and have enough rode for error. It's better to be early in tossing the anchor than too late.

Setting the Hook

We've already mentioned one way of setting the hook by using forward speed. However, this is frequently not feasible. An alternative approach is to wing out the main (or mizzen if you are a ketch) by pulling the boom forward with the preventer.

Of course if the engine is available and you are just practicing, you will eventually want to back down under power on the anchor.

Anchor Size

Anchor size (and type) has a big effect on the tactics you use and just how tight of a space you can deal with.

The bigger your hook (relative to your boat) the quicker it will grab the bottom, and the better it will work in adverse conditions.

Having an oversized anchor substantially reduces the chances of dragging. If you are sure the anchor is going to bite quickly, without drifting, you can anchor in much, much tighter quarters.

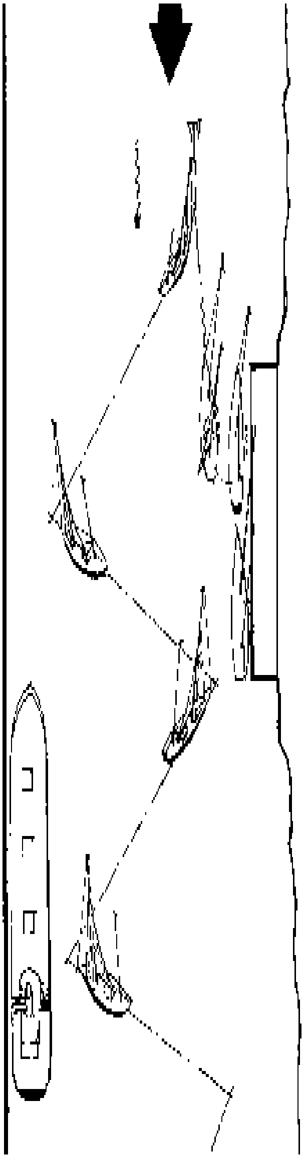
Room to Leeward

One of the key factors you will want to watch when sailing (or powering) in tight spots is your room to leeward. You will want to maintain enough distance from obstacles to leeward so there is a margin of safety if something goes wrong.

The problem may be as simple as a windshift, or perhaps a tack is missed due to the jib sheet hanging up. Room to weather gives you time to correct the situation. Perhaps this means dropping the anchor or switching on the engine.

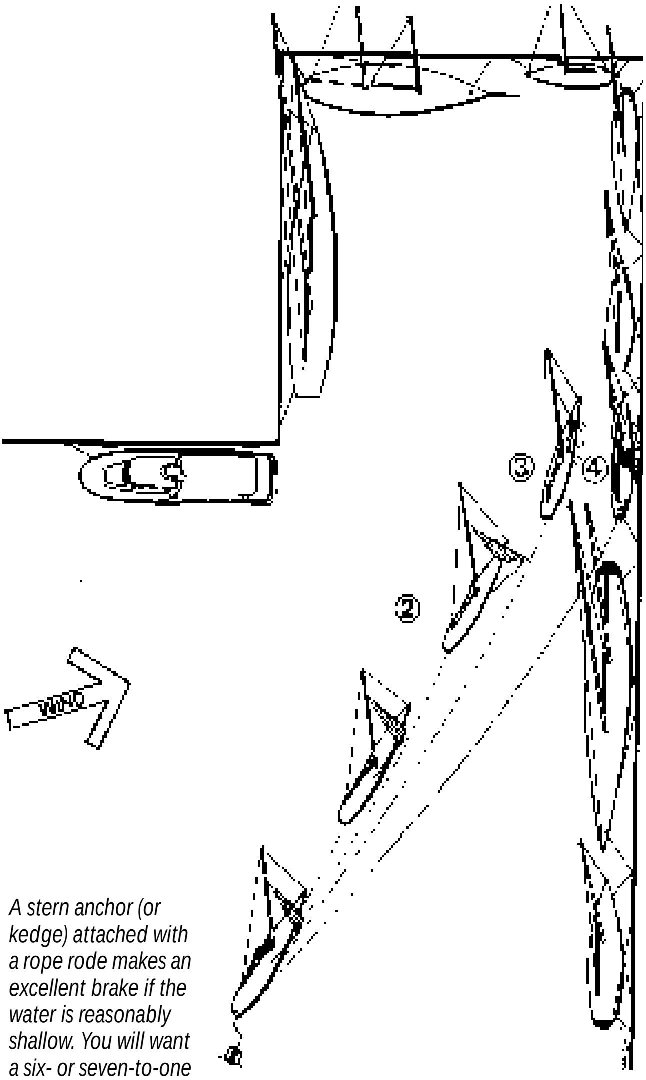
The amount of space needed depends on the boat, the obstacles to leeward, and what the consequences are of being blown down.

The biggest problem is usually getting free when you do get stuck on a leeward obstacle. The wind holds you there, you can't sail off,



When we think back to sailing into the dock at East London—and look at how tight it was on the chart, it seems almost impossible. Yet we had no trouble handling our 50-footer in those tight confines. And if the worst had happened, if perhaps we missed a tack, we were always in a position to drop the hook, and then use the dink to tow us into position.

Help



A stern anchor (or kedge) attached with a rope rode makes an excellent brake if the water is reasonably shallow. You will want a six- or seven-to-one scope between where you drop the hook and where you expect it to stop you.

Once the rode has run out to a four- or five-to-one scope, gradually apply pressure, allowing the rode to slip a bit, so the anchor can gradually dig itself in. Be sure to have a fall-back plan if something goes wrong.

and if you have the option of using the engine this will probably just drag you down on the obstacle.

If you do get stuck, the best way to get free is usually to set an anchor to weather, and then pull your bow off and into the wind, from whence you can then begin to sail again.

"Average" Boom Position

We have found over the years that there is an average position where we can sheet the main boom (or in the case of our ketches, main and mizzen) which works okay for beating and broad reaching. It is not perfect for either position, but draws well enough that if we are jibing back and forth, working our way through really tight spots, we don't have to adjust the boomed sails.

This leaves us free to concentrate on the headsail.

Sailing Bare Headed

Both *Sundeer* and *Beowulf*, and most of our other commercial designs have been designed to sail bareheaded in any sort of moderate airs.

We find that this aids sailing in tight quarters immeasurably. You can then concentrate on positioning the boat exactly where you want her, tacking and jibing at will without worrying about jib sheets.

Many modern single stickers can be sailed bareheaded too. It is just a question of having a large enough mainsail and enough breeze. Try it sailing without your jib and see what happens. You will probably need to sail a little more off the wind when heading to weather, and will need a bit more boat speed to tack.

It also helps when tacking to ease the main sheet or traveler and head off more on a close reach, until there is enough speed on to get the keel lifting, at which point you can then feather back to windward a bit.

Help

Backing Down under Sail

The day may come when there isn't room to turn the boat, or tack without running into an obstruction. At this point, short of getting the anchor down in a hurry there is one option left—backing down under sail. This is the ultimate way to show off your maneuvering skills—and to get yourself out of a tight spot.

While the actual techniques vary widely from boat to boat the basic principle is the same for all: keep the bow close on head-to-wind, use windage and/or sail to provide downwind power, steer with the rudder in reverse within a *limited* range.

The Backstaysail

The rig needs to be set up to get the center of the sail plan as far aft as possible. This makes the balancing/steering job easier. On a cutter or sloop try rigging a riding sail, storm jib, or staysail *on the backstay*. If your topping lift is in the way, set the boom down on the cabin top (or gallows) and ease the topping lift. When it's blowing enough (usually 6 to 8 knots or more) just this backstay sail and natural windage of the spar will often be enough to get you moving in reverse at a good clip. In lighter winds, the windage of the mainsail may be needed as well.

Split Rigs

When you have a split rig your job is going to be easier with a wider range of options. The mizzen (mainsail on a schooner) is sheeted home hard, dead amidships. This acts as a riding sail, holding the bow pretty much head to wind.

In a good breeze that's all that will be required to start you headed astern. As the breeze drops the mizzen can be pulled to windward (towards the bow) to provide additional power. In really light airs a part or all of the mainsail will be used.

Steering in Reverse

Steering in reverse is actually quite simple if you *face aft* as you work the wheel or tiller. Turn the wheel in the direction you want to head—but be sure you do this facing aft! With a tiller, think of the trailing edge of the rudder as pointing the way you are going to turn.

Where things get tricky (and why it's a good idea to practice backing down under sail in the open to begin with) is that you have to maintain a balance between wind angle and the course you're heading. There's a limited amount either side of head to wind in which the boat can be controlled. This angle is very much a function of how far aft the center of effort in the sail plan lies, and your keel/rudder configuration.

Fin keelers with aft hung rudders (skeg mounted or spade) have more latitude than full keel designs, but both can use these techniques.

Using the Mainsail

While a mizzen or backstaysail is the best option it is frequently possible to sail in reverse using just the mainsail.

Maneuvering in tight quarters under sail:

- ❑ Check layout of harbor before entering.
- ❑ Study charts and guides for obstacles. Make notes of anything critical.
- ❑ Note state of tide. Try to enter with a rising tide in case it is needed to float you off a grounding.
- ❑ Have main anchor over bow roller with a trip line, ready to go in an instant.
- ❑ If really tight, have kedge, with rope rode flaked on deck, ready as well.
- ❑ Dinghy should be uncovered, empty, with sling attached ready to launch (if you need the kedge!).
- ❑ Clear any extraneous running rigging from on deck.
- ❑ Make sure headsail sheets cannot hang up on mast or deck hardware.
- ❑ Use a blade or lapper jib rather than genoa.
- ❑ Clear cutter stay (or switch to staysail for easier tacking).
- ❑ Pre-set runners if they are required. Otherwise, pull them forward out of the way.

Whether the main is used full, or partially hoisted, some easily adjusted system of pulling the boom forward must be employed. In light airs a crewmember can push the boom out and hold it against the wind, but in a bit more breeze a preventer will be required.

The best system is to run lines from the cockpit to a block at the bow, and then to the end of the boom. These lines allow the boom to be winched against the wind, on either tack, from the cockpit. Lines on *both* sides should be rigged as it may be necessary to move the mainsail from side to side to compensate for wind shifts.

It is not unusual to have to swing the boom from side to side to keep your average track directly downwind.

With a ketch or yawl, preventer lines on the mizzen boom can be used to pull the sail from one side to the other. This will push your stern in the opposite direction. This is a very useful tool to dodge objects you're heading towards when there isn't enough steering range available from just the rudder.

Backwards in New Zealand

So far this all sounds pretty theoretical and you're probably thinking "I'd never do that." But some day you may not have a choice. That's what happened in Auckland, New Zealand, aboard *Intermezzo*.

Our transmission had given out (we had this problem on three occasions during our circumnavigation) on our way down the New Zealand coast. Sailing into Auckland Harbor and anchoring were straightforward tasks and we were not in the least concerned. But a couple of days later a windshift put us in an uncomfortable and potentially dangerous spot with boats which were anchored too close by. There wasn't room for us to lift the anchor free and have the bow pay off in time to get *Intermezzo* sailing to windward. Our only escape lay straight downwind.

We discussed the alternatives and we figured we'd give it a try. After all, we had backed lots of dinghies out of waterways so why not *Intermezzo*?

With the wind blowing in the high twenties and gusting 35-knots we heaved the anchor short. Our little mizzen was sheeted as hard amidships as we could get it. Both mainsail and staysail were ready to hoist, with the main sheet flaked and pre-eased on the cockpit sole.

The minute the anchor broke free of the bottom we were off downwind. Once we'd gathered a couple a knots or so of speed we had enough control to pull the mizzen towards the bow. This increased our speed and control. We passed two startled neighbors close aboard, and within a minute were at the bottom of the anchorage with room for the bow to pay off. We hoisted the main, backed the jib to blow the bow to leeward and then eased the mizzen sheet, and we were off.

The key to reverse sailing techniques lies in getting up enough speed to allow the rudder to have some bite. Once this speed is achieved, typically one or two knots, maintaining an exact head-to-wind attitude is not so critical. In fact, with a speed of a couple of knots, boats with efficient keel/rudder configuration can turn as much as 10 or more degrees off head-to-wind.

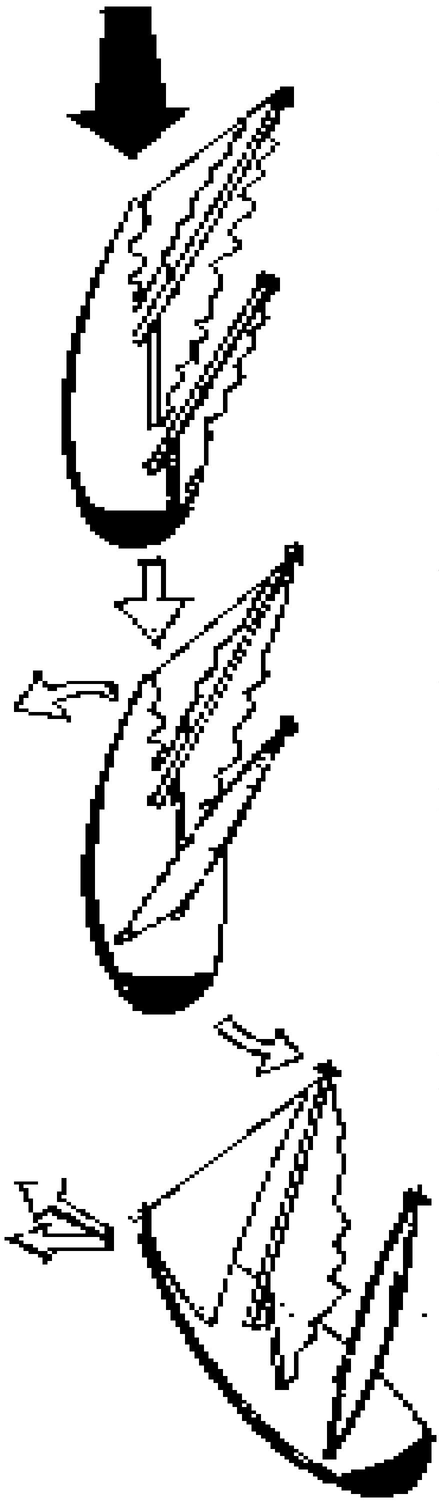
If there's a strong breeze blowing, as we found out in New Zealand, frequently the easiest route is to use only the mizzen or backstaysail to hold the stern downwind with little or no mainsail. Windage alone will do a pretty good job. Of course, headsail and main halyards will be attached and ready to use once you're clear.

If the bow does start to blow off, or a major windshift occurs you may have to use a little bit of forward way to bring you head to wind again. Then the process can be started over.

Getting the Bow to Pay Off

When the time arrives that you want to start moving forward the direction which the bow pays off may be critical. The rudder by itself may not have enough leverage to force the bow off far enough (or in the correct direction). However, by sheeting the jib to weather (or unrolling to weather, i.e., opposite the direction you want the bow to turn) you can force the head around. Leaving any after sails (main or mizzen) loose while the jib is backed will help this process.

If you are sailing on a boat which does well without a jib the key will be getting the main (or main and mizzen) eased well out before they start to draw. This way the boat has a chance to accelerate getting some flow over the fins so they become effective.



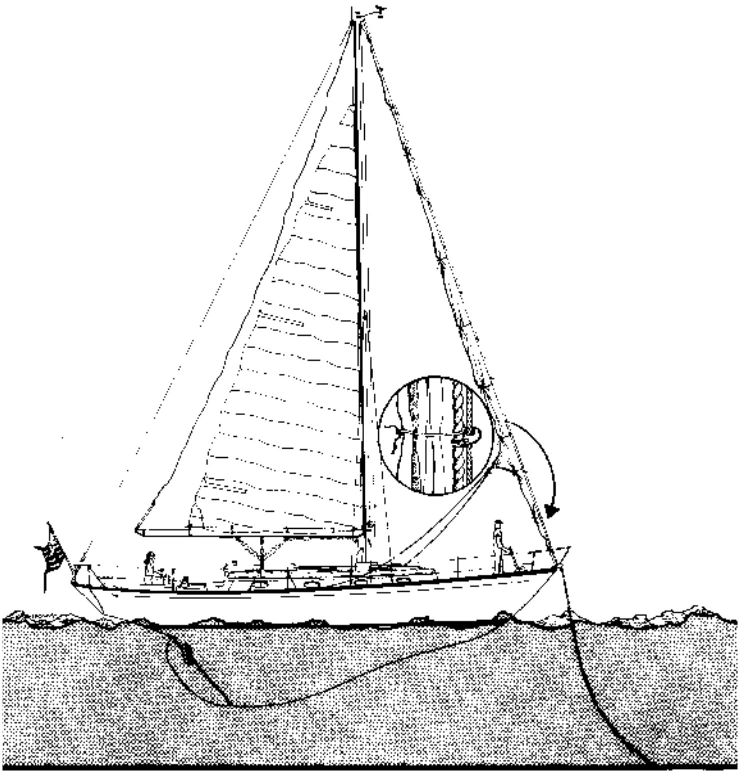
Split rigs have the easiest time with sailing backwards, but single stickers with a riding sail (or storm jib) set on the backstay can do this as well.

In this sketch we are starting with all sails set. The anchor is broken free, and then the boat starts to drift backwards (top drawing).

In the second drawing the mizzen is pulled to weather to accelerate the drift to leeward, and push the stern in the opposite direction. The bow pays off to port as the stern swings to starboard.

In the bottom drawing the boat is ready to accelerate forward. The jib will need to be sheeted to weather (not shown here) to pull the bow around, or if you are far enough off the wind it can be sheeted in directly.

Help



Sailing Out the Anchor

Sailing out the anchor brings with it the luxury of time to plan in advance and of already knowing your surroundings. If there is any doubt about the anchorage, a tour in the dinghy with a lead line or portable depthsounder will often give you a better feel for conditions.

The tactics to be used depend very much on the efficiency of your anchor retrieval system and the depth of the water. The faster the anchor can be brought up, the less time and distance you will spend drifting back until you have way on in the desired direction.

You can often get the boat to lie head to wind against the rode with a partially hoisted mainsail. The jib is left in stops or roller-furled until the anchor has been brought home.

Then break the jib free to the opposite side you wish the bow to turn and use the backed jib to force the bow in the correct direction.

If conditions are marginal for getting the anchor secured, consider slipping it with a buoy and return later to pick it up when conditions have improved.

With split rigs our practice is to set the mizzen and sheet it home hard. We then hoist the main part way. The next step is to heave the anchor short. This brings the boat almost directly over the anchor, with just a bit more rode out than the water depth.

The mainsail is then fully hoisted, with the sheet left totally free so the main feathers back and forth.

The process with a single sticker depends on the percentage of sail area in the main and its relationship to your center of lateral resistance.

On cutters, with a small main, you can usually hoist the main and leave it sheeted as the boat will stay head to wind. But as the mainsail becomes a larger percentage of area you will find that it must be eased so that it doesn't start you sailing.

Some mains make it very difficult to keep the boat head to wind and in this case it may be necessary to have the main ready to go, but avoid hoisting until the anchor is off the bottom.

Favored Tack

At this point you will want to decide which is the favored direction to sail on your first tack. As mentioned before, you will want enough room to fall off and accelerate before the next tack.

Help

It may be that space is simply too tight on either side and you need to drift back awhile.

Or, if the wind is shifting back and forth in direction (very common) you will watch things for awhile getting a feel for the wind shift cycles. When the wind goes into a favorable angle you begin to hoist the anchor.

Once the anchor is broken free the main is then hoisted as quickly as possible.

With a ketch rig you will end up drifting back in more or less a straight line as long as the mizzen is sheeted in hard. So, once you want to get the bow off the wind the mizzen needs to be eased.

The jib is then unrolled, (or broken out of its stops) with the sheet being pulled to weather, opposite the side you want the bow to turn.

If you want to pay off to port the jib is sheeted to starboard. As the jib backs the bow will begin to blow off to leeward. Once you have a beating angle, release the sheet, trim to leeward, and then get the main sheeted home.

Remember to turn the wheel opposite the desired direction of turn as you are making sternway.

Beating in Tight Quarters

When you must beat out of the anchorage, pay particular attention to the distance to leeward available for falling off and then accelerating. It will take some seconds before the boat has enough way on to allow the sails to be trimmed properly and then complete a tack successfully. If actually getting the anchor up could delay you long enough to dangerously compromise your maneuvering room, you may have to cut the anchor free and come back later to pick it up. If this is a possibility, be prepared to buoy the end of the rode.

Short tacking in tight quarters requires a bit of coordination on the headsail sheets and helm. The more efficient your sail shapes and the cleaner the bottom the better off you will be.

When It Is Blowing

Sailing out in moderate air is one thing, but what should you do when it really starts to blow? We like to hoist the main reefed flat and sheeted hard amidships. If our headsail is not roller-furling, it is hoisted in stops. Then, as the anchor comes clear, the headsail is broken out and backed to start us moving. In heavy air roller-furling makes things easier. Hoisting the jib unfurled and unstopped isn't feasible in a strong breeze because of luffing. It also tends to blow the bow back and forth.

Using Just the Jib

If all you need to do is to head off downwind to escape sometimes it is easiest to bring the anchor home, and then use just the jib to sail out of the harbor. Once you've gained some sea room, the mainsail can be hoisted.

If the direction ahead is difficult to maneuver in and you can drift back and clear the anchorage, it often makes sense to bring the anchor home and just drift back until you are free.

A centered mizzen or backstay staysail can be used to keep the bow into the wind until you are clear.

On *Beowulf,* we often drift out of an anchorage using just the mizzen. Then, when we're clear, the jib unfurled. main is hoisted and

Sailing the anchor out:

- ❑ Prepare main to be hoisted quickly.
- ❑ Hoist jib in stops (or flake out roller-furling control line.
- ❑ Flake jib and main sheets.
- ❑ Be ready to slip and buoy anchor if required.
- ❑ Determine favored tack.
- ❑ Watch wind oscillations for 10 to 20 minutes to find right time to break anchor free.
- ❑ Have kedge ready to go if conditions are really tight.
- ❑ Use jib to blow bow off in desired direction.

Ken Argent

Ken Argent has a wide and varied background in commercial maritime work as well as professional yachting. Since 1966 he has sailed on or captained a wide variety of sailing vessels ranging from dinghies to ocean racers like *Kahili*, to classic schooners like *Panda*. Ken has also captained motor yachts through 180 feet (55 meters). His commercial work includes a variety of tugs, fishing vessels and oil platform supply ships up to 220 footers (70 meters).

With such a wide and varied background, his comments on seamanship are worth pondering. We asked Ken what routine he goes through before heading off on a passage.

Heading to sea: Ken's approach varies somewhat according to the type of boat. However, the basics always apply:

- ❏ Safety equipment, flares, rafts, fire equipment must always be checked for current inspection tags.
- ❏ Hull, rigging, sails and machinery should be tested and checked for soundness.
- ❏ Storm windows or shutters should be installed before leaving.
- ❏ Charts, tables, almanacs and navigation equipment should be checked and made current.
- ❏ Suitable first aid and trauma kit should be on board and all medication within expiration date.
- ❏ Necessary supplies, food etc. should be on board and properly stowed to avoid any spoilage.
- ❏ Suitable spares for all essential equipment should be on board and stowed where accessible.
- ❏ Safety lines may be set up and rigged.

Watch Standing

My preferred watch system, assuming one has enough crew, is two people on watch at all times, four hours on eight hours off with meals at 0800, 1200 and 1800. This of course would probably only apply to larger boats. I am, however, quite opinionated about the importance of having two people on watch. I think that it is not only much safer but also much more enjoyable. There are of course many choices of how watches are set: three on, six off is very popular but that dogs the watch every day and I personally find that I do not get settled into a routine.

For short-handed sailing, like a couple for instance, three on, three off is probably the preferred setup.

Having had merchant experience, I am a firm believer in Station Bills. I draw the Bills up and after posting them, make sure that each crew understands the Bill and is aware of the position they are to take in the event of a specific problem. I will also conduct drills but find that most crew know that it is a drill and do not take it as seriously as they should. As long as crew understand where they are supposed to be in any given situation and know what their specific job is, things will usually go smoothly.

Weather Routing

I have used weather routers and found them to be very reliable. However, I prefer to get the weather from weatherfax, sideband/or any other method, from as many stations as possible, and make my own determinations and choices.

A classic example of how receiving different countries' reports can make one's life better follows: We were crossing the Atlantic from Gibraltar to Antigua in late October or early November,1985 (I think) in what can only be described as crappy weather. None of the US stations or routers were giving any warnings of anything unusual in the Atlantic. However, I had the frequencies which Moscow sent the reports via weatherfax to their fishing fleets and decided to get a map from them. The map showed a very defined low starting to form

Help

almost exactly at our position. It turned into Hurricane Kate which did terrible damage to the St. Martin area. The US stations did not start to forecast a problem for several days and the guys who were relying on them got into serious trouble. By being aware of the situation we were able to make the necessary adjustments to our course and speed and minimize the effects of the storm.

First Sail of the Season

Ken sent along the following story as a cautionary tale all of us should heed.

Spring is an exciting time for sailors everywhere, especially when winter has prevented any boating activity for what seems like forever. It was like that for us this year, the second we had spent in Nova Scotia, and I couldn't wait to get the boat in the water and start sailing. We had moved to the Annapolis Basin, off the Bay of Fundy, from Florida and were used to sailing whenever we wanted, without being controlled by the seasons. By the time the Spring Equinox had passed, I was ready to get on the water, one way or another. I had a little 20-foot (6-meter) Paceship centerboard daysailer which I had stored in the barn over the winter, and the first sunny day without the threat of frost or snow saw me pulling the boat out to get ready for the upcoming season.

Once the boat was out of the barn, I stepped the mast, attended to the rigging and sails, put a couple of coats of varnish where needed and painted the bottom. By the time I had finished this flurry of manual labor, the weather had decided to take a turn for the worse again and boating plans went on hold. There is nothing more frustrating than having the boat ready to go, but the weather will not allow it. This frustration is evident whether you are attempting to make a trans-Atlantic crossing, or trying to row across the marina to get to the pub.

The weather finally turned spring-like again and I couldn't wait to launch the boat. Launching is a relatively simple procedure for me because I am lucky enough to have the two things that make it easy. The first is a beach at the bottom of the garden with a fairly smooth track down to it, and the second is a good tilt trailer. When ready to launch, I simply hook up the trailer to the jeep, drive it down to the beach, push the boat off the trailer onto the sand and wait for the 30-foot (9-meter) tide to come and float it away. In the past we have kept the boat on the half-tide mooring, which is about 700-feet (213-meters) out from the high tide mark and sailed from there as the tide allowed. This was also very convenient because everything which needed to be put back on board after the winter was in the barn and close by and any tools needed for last-minute adjustments were also handy. This year was different as I had decided to take a permanent berth at the

"I use two anchors fairly often, usually to prevent swinging through large arcs in crowded anchorages. Two anchors should also be used when tying up stern to, and in conditions of strong winds, although it is sometimes preferable to sit to one anchor on a long stretchy nylon rode. It becomes necessary to put to sea when conditions create a situation where the seas in the anchorage have built to a level that exceed the depth of water and makes it likely the boat will hit bottom in the troughs. It is also preferable to leave when extremely high tides are expected, causing debris to float from shore and other boats to possibly sustain damage against docks or break their anchors loose and go adrift. Wind alone should not force anyone to leave a safe anchorage, unless it becomes a lee shore situation and then it will be sea conditions and not wind alone which will force departure from the anchorage."

"Get experience from an expert who has been there and done it, not from one of the schools or organizations which teach wonderful theory, most of which is impossible to put into practice when it is important."

marina in Digby, about 12 miles down the basin, which meant that I would be able to sail at any state of the tide and also be much closer to the yacht club and the area of the basin in which we race.

The day that we, my wife Linda and I, launched the boat was absolutely perfect, warm and sunny with a light northwest wind. The plan was to keep the boat on the mooring for a few days while we checked out the outboard motor, generally sorted things out and did a little relaxed sailing. Besides, it was too early in the year for the marina to be in full operation and the racing season did not start for several weeks yet. Well, once that boat was off the trailer I wanted to go sailing, and since it was such a perfect day, I said to Linda that we should not keep the boat here at all, but sail directly to the marina and get settled. We would, after all, get the best of the ebb tide to carry us down the basin and the light northwesterly would make it a beam reach to Digby. Conditions could not have been better.

We had only been sailing for about 15 or 20 minutes when the wind died completely. We drifted around for awhile and decided that since we had the outboard motor we may as well use it; the run would do it good after a winter of inactivity in the barn. The outboard probably ran for about a total of three minutes before stopping from overheating. The water pump impeller had failed, which is not unusual after winter lay-up. This was one of the things that I had meant to check while the boat was on the mooring at the house because my tools would have been readily accessible.

Caught up in the excitement of going sailing, I had not put any tools on the boat, so there was no way to fix the problem. Thankfully, the motor was not really needed any more as the wind had started to fill in, so that we could sail again. Unfortunately the wind was now from the southwest which made Digby dead to windward, but it was still a nice day and fairly warm. The Annapolis Basin is about 16 miles long and between three and six miles wide and we started to make leisurely tacks from shore to shore. After awhile it became increasingly apparent that the wind was picking up and that we were not making as much ground to windward as I would have liked. The sea state had become quite confused and the short, steep chop was stopping the boat dead in the water. The wind had increased to about 30-knots, the tide shifted, a lot of spray was coming aboard, the clouds had moved in and it had definitely started to cool down.

The water temperature in the basin rarely gets over 58 degrees, even in mid summer, and in early spring is probably in the low to mid-40s, so the spray had a distinct sting to it. Our situation was rapidly deteriorating as the wind had started to gust well into the mid- to high-30 knot range and combined with the newly flooding tide, was creating a very unpleasant sea condition for a 20-foot (6-meter) boat.

I should point out that one of the jobs that I meant to do before doing any serious sailing was to have reef points put in the mainsail. I didn't, so as a result, we were unable to reduce sail area except by spilling the wind from the sails. The P20 does not sail well under jib alone nor does it sail well under main alone so in order to maintain drive it was necessary to keep both sails up but constantly trim and ease sheets.

As we were only dressed in shorts and tee shirts, the combination of wind, spray and lack of sun started to make us feel very cold. In the rush to catch the tide and get going, I had not put any sweaters or foul-weather gear aboard. So much for the perfect day for a sail!

I decided that we should short tack along the eastern shore of the basin to try to stay out of the tide, but even in the reduced current we were only barely making headway toward Digby. We were carrying far too much sail for the amount of wind and the two of us simply did not have enough weight to keep the boat upright, causing several knock-downs, and every time that we were knocked down the boat took on a great deal of water—the pump of course was in the barn. We did have a bailer, which although it couldn't get the water out from below the cockpit deck, would stop us from sinking.

We could not help thinking about the consequences of tipping the boat over or sinking, and even though we did have life jackets (amazing), we would not have survived for very long in that cold water. It took over five hours, but we did eventually arrive safely in Digby and tied the boat up with no damage, except that a couple of hours after getting back home I was rushed to hospital with an attack of kidney stones.

This is not written simply to be just another sea story, but to point out that I, who should know better, had taken off in a boat without telling anyone where we were going, without listening to a weather report, without a radio or cell phone to call for help, without adequate clothing, without making normal checks before leaving, and without many of the basics which should always be on a boat. This whole thing could have been avoided and our lives need not have been put in danger simply by a few hours of preparation and thought. Had I had the kidney stone attack a couple of hours earlier, it would have been unlikely that Linda would have been able to control the boat alone.

I should know better because I have been at sea as a professional on commercial fishing boats, power and sailing yachts, oil field support boats and various other types of vessels for most of my adult life. I should have known better, but I was complacent, too eager to get sailing and was only sailing in the bay anyway. What could go wrong?

The Grand Banks schooner Highlander. In days gone by, when iron men went to sea in wooden ships, your skill as a seaman (or lack thereof) had a direct bearing on the safety of yourself and your mates. Modern yachts are far more forgiving, and weather forecasting techniques have improved tremendously. Still, working on the deck of a small yacht required a certain amount of diligence and awareness, lest you be taken unawares by the sea.

WORKING ON DECK

Most of us would prefer to sit in the cockpit and enjoy the ride. If we move anywhere, it is down below for a snack or to check the chart. Getting out of the cockpit and going forward means exposing yourself to the elements (read, getting wet!) and we'd be kidding ourselves if we didn't admit that there are safety risks (albeit small) as well.

In the next section we'll deal with working on deck, handling running rigging, going aloft, along with a few other skills which are going to come in handy at some point.

Help

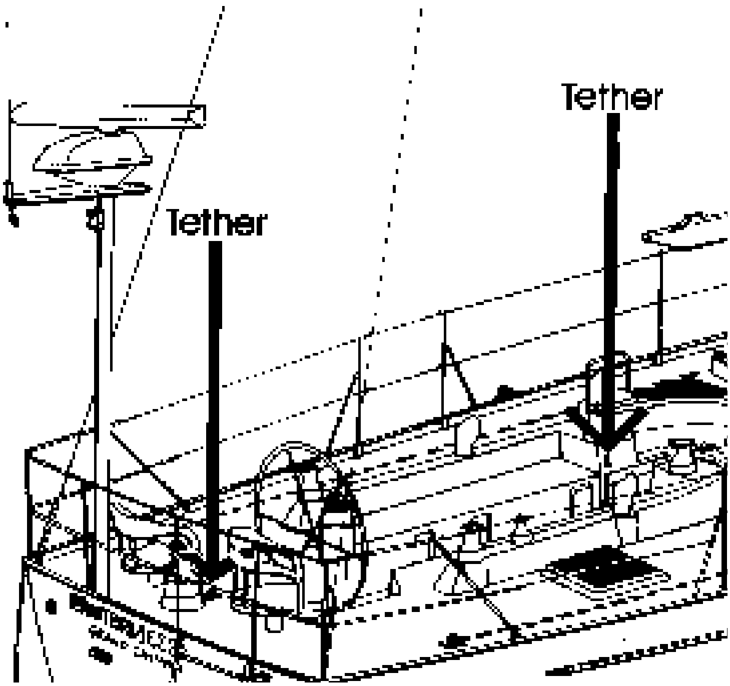
Safety at Sea

We've always operated on the assumption that if one of us went for an unexpected swim while underway, it would be next to impossible for the other to get the boat turned around in time to find the one overboard. Having to singlehand because the other was seriously injured wasn't a pleasant prospect either. As a result, we developed a conservative approach to working on deck.

For more information on safety harnesses see page 117 in *Surviving the Storm* and page 235 in *Offshore Cruising Encyclopedia*.

Use a Safety Harness

The cockpit on Intermezzo II was similar to what you find on many 40-foot (12-meter) and up sail boats—a long "T" shape with only a helm and binnacle for handholds. To reduce the risk of becoming detached from the boat we welded in padeyes at the companionway and on either side of the helm all the way aft.



The words "safety harness" usually conjure up visions of sailing in gale-force winds against monster seas. But we feel that you are most vulnerable on deck in calm to moderate sea conditions. This is when your guard is down. You don't expect the errant wave or unexpected lurch that could send you swimming.

For this reason it has always been our rule to wear harnesses *whenever* we leave the cockpit if under way. No, it is not always necessary, but getting used to the harness and having it on makes its use second nature. At night, we hook up our harnesses before we leave the companionway. We each rest better knowing the other is securely tethered to the boat.

There must be lots of convenient attachment points for the safety harness and the first should be a heavy padeye

Help

Above, Elyse (foreground) and Sarah during a passage through the Torres Straits between Australia and Papua New Guinea. They are sitting on top of the companionway hatch. Note they are both wearing harnesses with a tether which is long enough for them to move about the cockpit or make their way below to the saloon.

In the right photo you can see the padeye at the companionway (white arrow).

(equal to the breaking strength of the rope) alongside the companionway. It must be placed so you can attach it either in the cockpit or from down below before coming on deck. An extension line should be made up that will allow you to work anywhere in the cockpit, or to go forward just a bit, and then return to your belowdeck watchkeeping station, all the while remaining hooked up.

A jackstay is best for going forward. We use a piece of polyester webbing one inch (25 millimeters) in width, with a 6,000-pound (2,700-kilogram) breaking strength.

Tethers

We like to use two tethers, one which is about six feet (1.8 meters), or the maximum we can clip back on itself when we're not connected without tripping over it. A second, shorter tether is also in place for use when we want to be held more tightly or when changing from one connection point to another.

Tethers can be webbing or line. While we used to use 7/16-inch (11-millimeter) polyester line, today we are using 1/4-inch (6.3-millimeter) Spectra line of the same breaking strength.

Connection Points

Avoid using lifelines and stanchions as attachment points. They are notoriously unreliable under load. Standing rigging should be used only as a last resort.

On *Intermezzo* we also attached a 15-foot (4.5-meter) line to a padeye at the companionway entrance that allowed us to remain hooked up even when we were down below. We could come on deck, take a look around, perhaps go aft to read the taffrail log, and return below without having to think about where or to what to attach ourselves. It was handy for the children during the daytime as well. Their rule was to hook up before entering the cockpit at all times. As the cockpit was more secure on *Intermezzo II* and the children were older and more responsible, this rule was only enforced in the evenings or if they were on deck without adult supervision.

On *Sundeer* and *Beowulf,* with much more stability under foot, we do not hook up in the cockpit under normal conditions. However, if it is rough out we hook up before leaving the pilothouse, and as mentioned earlier, at night when the off watch is asleep.

Handholds

The second way to minimize the risks of falling overboard, or simply falling, is with secure handholds. Your boat should have handholds anywhere you will have to work. They can be dinghy rails, cabinside handrails, standing rigging, mast bars, or handrails over dorades. *Lifelines are the handholds of last resort and should never be totally relied upon.*

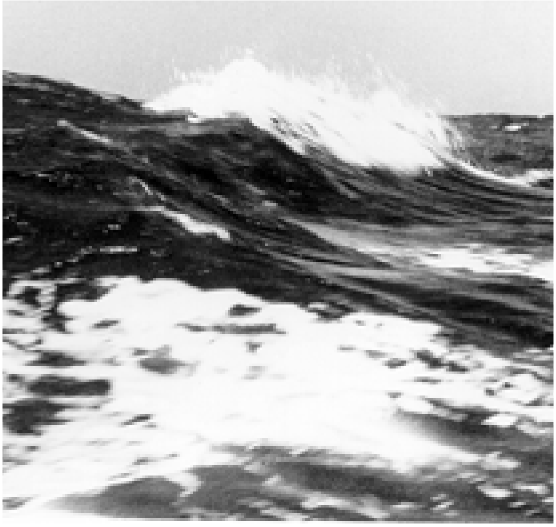
When you move from hold to hold, keep your center of gravity low for maximum body stability. With your feet spread, knees bent, and chest hunched forward, you are less likely to be knocked about by an errant wave.

It is often possible to rig an inboard "man line" between the dodger and a handrail or lower shroud forward. The fact that you are holding onto something inside of the lifelines is a great help.

These two photos were taken aboard a lovely Dutch cutter in Curacao, sailed by a single hander who was very concerned with arriving at the same time as his boat.

Note the heavy handrail worked into the aft part of the dodger frame, to which the man line is attached. If you're sailing on a split rig you can rig man lines between the main and mizzen cap shrouds.

Help



The waves that we worry about are the "sneakers" which catch you unawares in otherwise moderate conditions. This particular crest, although not very large, was the only one we saw of any size for an entire afternoon during the passage between the Marquesas and California.

Working the Deck

As you work on deck you learn to anticipate the boat's heave and roll. An alert cockpit crew can shout a warning about an unusually large or mis-shaped wave. But you will feel it before it hits and have time to brace yourself if you are aware of the vessel's motion. In many cases you can detect a slight change in the pattern of motion just before a big one hits.

While you can concentrate on handholds when you're simply moving about, it's a different matter when there's work to be done. Your attention is diverted and you have to put at least one hand to the ship's business. We like to brace ourselves to windward of the work so that any tendency for the boat's motion to fling our bodies to leeward (and overboard) will be checked by the brace.

If a line has to be rove on the boom and the bales are overboard, you have to lean out, a most uncomfortable and potentially dangerous situation. In this case, make sure your tether is secured at the minimum length. It may be necessary to hook your knees under the lifelines in these circumstances. (Presumably you inspected the lifeline systems and attachment points with care and seized all lifeline gates in port before you began your passage.) It is always better to head up, bring the boom inboard, do the necessary work, and then head off back downwind again.

Avoid relying upon sheeted sails for support. When you lean against the boom or a headsail clew, even when a steady wind is blowing, you are also betting that the sheet or traveler will stay in place. What happens if it has nearly chafed through or isn't cleated securely?

Don't Stand in a Bight of Line

When a sheet runs aft to a snatch or turning block and then comes forward to a winch, the load on that block is twice what it is at the winch. If you stand in the open "V" and the block fails, you are likely to be injured. The same goes for booms that depend upon halyards, topping lifts, or sheets to hold them in check. If you're standing to windward, you are out of the way if something goes wrong.

Help

Shoes

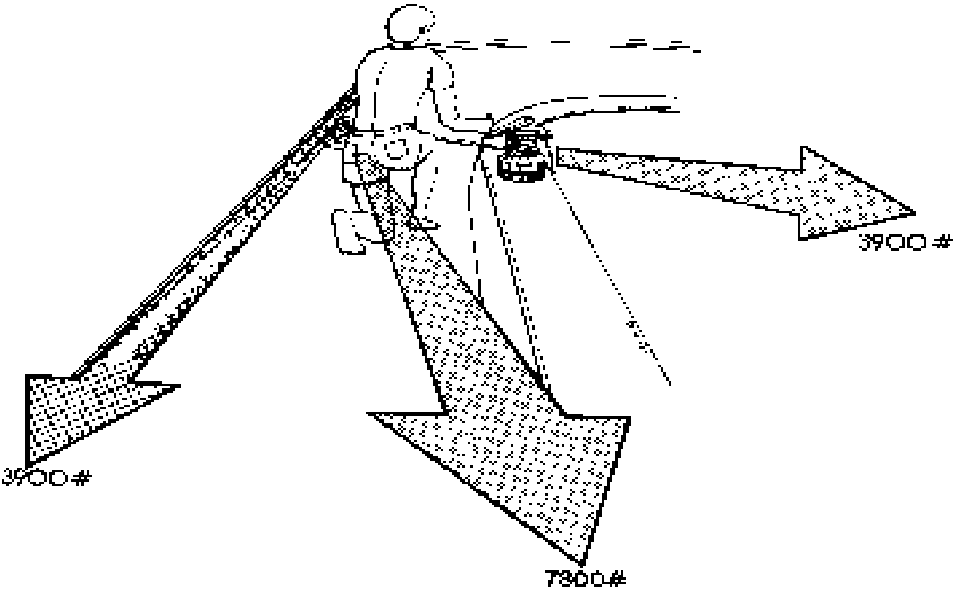
Good shoes are vital to safety on deck. In our experience different brands have widely varying traction depending upon whether the deck is wet or dry and the type of nonskid pattern in use. Be sure your shoe tread adheres well to your wet, heeled deck. Then be certain your sea boots have similar characteristics. Some types of sea boots are adapted from hiking or fishing styles and have very little wet traction.

Before sailing shoes became a fashion statement, and were worn ashore, they had very soft, sticky soles. These soles had really good traction, but wore out quickly on land. Newer shoes do not work nearly as well as they are designed for fashion first, and sailing second.

We have had good luck countering this trend in sporting good stores which sell mountain climbing footwear. Some of these shoes have very soft soles which work well.

Toerail

All seagoing vessels should have a toerail at least 2 inches (50 millimeters) high. It provides a convenient bracing spot when working to leeward on a heeled deck and can catch errant winch handles.



Any time a line changes direction the load on the block is increase substantially. If the line does a 180-degree turn, the block sees double the load of the line. In this example, with a sheet load of 3900 pounds the block would be at 7800 pounds.

Since deck hardware does on occasion fail, make it a habit not to place yourself inside the "V" or "bight" formed by the two ends of the line. This way if there is a failure, you won't be in line for the shrapnel when it comes flying by!

Help

The Foredeck

Of all the chores that come with passaging the one we like the least (even less than rebuilding a bilge pump or unplugging the head) is making a headsail change when conditions are less than ideal.

However, if there's one rule we've learned about making a headsail change it's *don't procrastinate*. If you know a job has to be done, do it. The longer one waits (usually) the more difficult conditions are going to be.

Always use open lanyards on your snap shackles. This reduces the chance of anything snagging on the lanyard.

A figure eight knot should be at the end of each halyard, main and jib sheet; but not spinnakers as in an emergency you might want to cast off a sheet or guy.

Halyards

Setting up halyards for easy use (especially at night) is one of the keys to an efficient foredeck. First, the snapshackle should operate freely. Lube the pin and hinge point with a light silicone grease. Make sure the pin is straight, has a firm spring, and opens smoothly.

The ring or shackle at the end of the clevis pin needs a short lanyard. This is easy to grab when your hands are wet, and can be used to tie the shackle pin in a closed position.

Nothing is worse than a tangle of halyards around the headstay or each other. To reduce risks the halyard ends should be color coded. We use vinyl tape over the nicopress fitting right at the shackle; white for the jib halyard, blue for the staysail halyard, with red and green for port and starboard spinnaker halyards. At the mast, each halyard exit point has the same color coding.

Finally, the bitter end of the halyard should always have a figure-eight knot

Help

tied in so the halyard can't run up the mast (in fact to be really safe, the tail of the knot should be sewn shut so the knot can't unravel).

Mast Preparation

How and where the unused halyard ends are secured when passaging involves several factors. They'll need to be far enough from the mast to avoid slapping when heading upwind. They must be out of the way of the staysail or jib clew when tacking. There should be enough separation between halyards that they are easy to keep apart when changing sails.

It's essential to have easy-to-use provisions for tieing off halyards, both those in service and the lazy halyards. Sometimes adding a couple of 6- or 8-inch (150- to 200-millimeter) cleats to each side of the spar can do wonders for organization (as long as they don't catch headsail sheets when tacking). There will rarely be enough winches for every halyard, so make sure that the various combinations of halyards to winches lead cleanly, without trapping other halyards in the process.

Next, we need to look to working at the mast. If you're to windward of the spar, life's easy as you can brace against the mast. But working to leeward is another story. Ideally, there will be mast support bars. If not, perhaps a couple of lines or a piece of metal tubing can be rigged if you have fore and aft lower shrouds. Finally, there will need to be a spot to brace feet to leeward. Perhaps there is a toe rail which will work. If not, consider adding an angled teak block each side of the mast, about three feet (900 millimeters) from the base.

Making up Halyards

There are probably a dozen "correct" ways to coil and tie off a halyard. What is important is to be sure and use the same system on all lines. This way, whomever is forward can untie and flake down the halyard without getting things into a big snarl.

Sail Preparation

Working the foredeck usually involves changing headsails. With hank-on sails it helps to check each hank a couple of times a year. As with

Tommy Miller (below) furls a hank on working jib on the foredeck of Locura. Note the lifeline lacing, which does wonders to keep sails onboard when it is wet forward.

Help

halyard shackles, make sure the pins are lubed, and that they open easily yet are held firmly closed by their springs. This is especially true of heavy sails which may rarely see action.

For sails fitting into a luff groove often a spray of Teflon lube will help reduce friction as the sail is being hoisted.

Foredeck Netting

Working some light netting through the lifelines from the mast to pulpit helps keep sails onboard. Start by adding a third lifeline just above the deck. This can be made from 1/8-inch (3-millimeter) 1 x 19 stainless wire and run through the support braces of the lifeline stanchions. Then, 1/8-inch (3-millimeter) or 3/16-inch (4-millimeter) line is laced between the three lifelines. We like to do it a section at a time, having one length of line fit between one set of stanchions. Using half hitches at the top, a single wrap in the middle, and then another series of half hitches at the bottom the lacing is worked forward. Horizontal separation of a foot (300 millimeters) or so between top and bottom work well. Be sure to leave a bit of slack as synthetic line will shrink after exposure to sunlight.

When you are working with sails, always position yourself inboard of the sail (as shown below). This way if a puff or wave catches the sail it doesn't take you over the side with it. (And unlike what is shown always wear a harness.)

Night Preparation

Usually the most difficult sail changes will occur at night. While you will soon know where things are by touch, a set of spreader lamps to illuminate the foredeck can help enormously.

Since the spreader lights will only be on occasionally, our preference is to have plenty of power, and then tune it down with duct tape if required. A pair of 50-watt quartz halogen bulbs, mounted under the lower spreaders, is ideal.

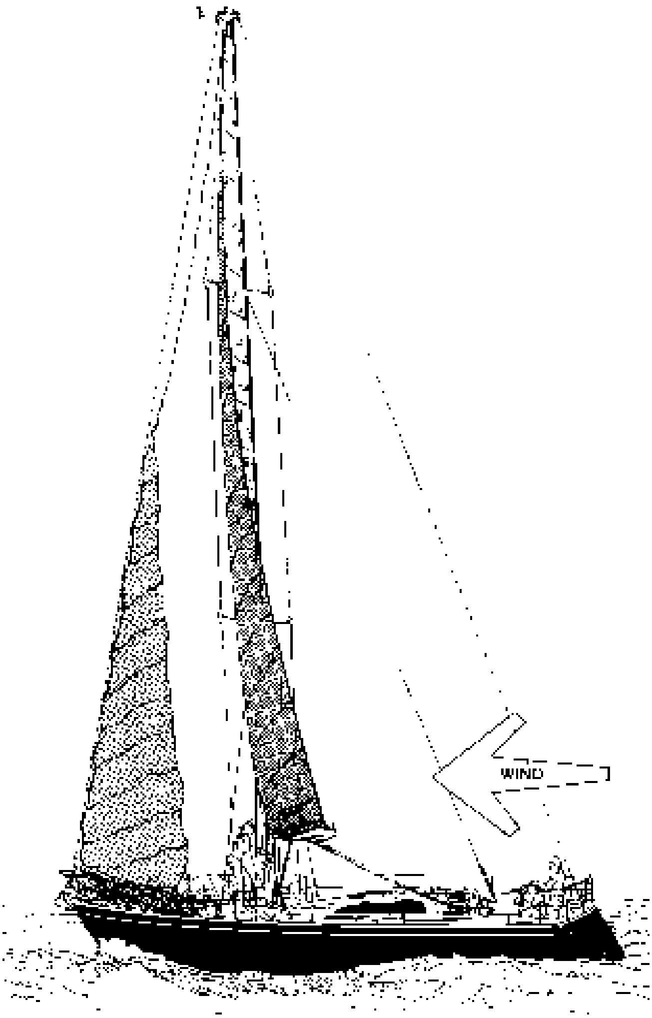
When the lights are installed angle them forward to minimize direct glare into the cockpit. The aft edge of the light cone should just catch the mast area.

Basic Safety Precautions

It's probably worth repeating a few safety rules that have evolved for us over the years. Even although most of our foredeck chores can be done singlehandedly, one of us will keep an eye on things from the cockpit, just in case a hand is needed or a course alteration required. Always use a safety harness, even in nice weather, and have it clipped to a jackstay at all times. If you need to unclip, the secondary tether is connected first to an intermediate point. Stay to windward of sheets and sails, and well clear of headsail clews that may take a swipe at you. Keep an eye on where you step. Avoid walking on sheets if possible. They roll out from underfoot at the most inopportune times. When walking keep your center of gravity low and have one hand on a firm piece of structure for support. Keep the corner of an eye peeled to weather for unusual seas that could upset the boat's rhythm.

Handling Headsails

Handling a headsail in a seaway or heavy wind demands caution. A gust of wind or a sea can catch the partially dropped sail and blow it overboard. Always position yourself so that you are to windward of the sail, and *do not stand on the cloth*. Not only will it be slippery, but it can take you with it as it goes overboard. If the sail does begin to blow over the side, have a firm idea of when the battle



Running off dead downwind, with the main eased all the way out, makes short work of most headsail changes as well as keeping the foredeck crew dry. If steering is suspect (because of self-steering gear or helmsman skill), rig a preventer.

Working the foredeck:

- ❏ Always wear a safety harness.
- ❏ Avoid standing to leeward of sails or booms.
- ❏ Do not walk on sails or running rigging (they are slippery).
- ❏ Have a standardized halyard storage system and always put halyards back in the same location.

Running off to drop or hoist headsails:

- ❏ Run square to the wind.
- ❏ Ease main boom out against the shrouds.
- ❏ Use a preventer on the boom unless you are 100-percent sure of whomever or whatever is doing the steering.
- ❏ Have halyard uncoiled and neatly flaked so it will run free.
- ❏ Make sure there are plenty of sail ties handy.

is lost and it's time to let go. At some point the sail is simply going to take off on its own, and you will be unable to stop it.

When you're working the foredeck, watch for flailing sheets and clews. A loose sheet can snap back and forth through a substantial arc. We have lost numerous pairs of prescription glasses and received an occasional welt by ignoring this rule. The place to be when sheets are flailing is all the way to windward or well aft of the clew.

Downwind Sail Changes

The first step in the take-down procedure is to flake out the halyard so it will run freely, starting with the bitter end at the bottom of the pile and working towards the cleat on the mast.

Downwind, the headsail will be billowing to leeward and impossible to drag aboard short-handed if the breeze is up. However, if the boat is headed off to a dead run, the main eased out against the shrouds, and the headsail sheeted moderately tight into the vacuum behind the main, it will collapse easily on the foredeck. (If there's a sea running and you're not sure of self-steering or the helmsman, rig a main boom preventer first). Don't sheet the headsail totally flat as this will make it more difficult to drop.

Working on your own, one hand will be required for the halyard while the other will be used to gather in the sail. We usually keep a single wrap on the winch, then I walk forward, halyard in hand until I'm ready to take the sail in. I'll control the halyard until the sail is about halfway down, then let it go on the run.

If it is rough, or you need both hands for the sail, the other crew will have to come forward and handle the halyard.

With the sail on deck, remove the halyard and carefully secure it so it doesn't become wrapped around the headstay or another halyard. The best approach here is to use a direct movement with the halyard hand to the temporary attachment point. Avoid switching hands, or walking around all of which can lead to real tangles.

Remove the hanks starting at the head and working down towards the tack. If conditions permit, bag the sail as it is being removed, putting the head first into the bag. This will make the sail easier to reattach at some later date.

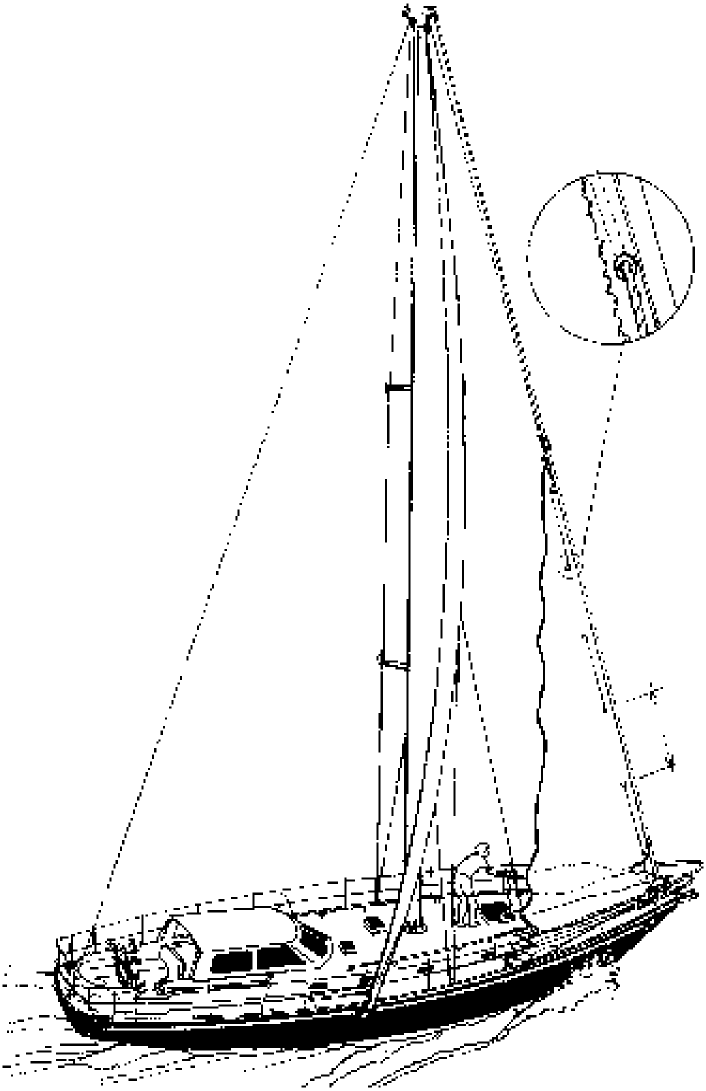
As soon as possible get the sail below, stowed behind the mast or aft of the cockpit (leaving sails lashed to forward lifelines is an invitation to disaster if a wave boards—which we've learned, to our sorrow, on a number of occasions).

Leave the sheets attached to the clew until the sail is well secured. Then, when the sheets are removed secure them tightly so they don't drag in the water (where they may foul the keel, rudder, or prop).

At some point, if it is blowing really hard, the hanked-on jib will start to climb the headstay on its own. In storm force winds you may need to winch the sail down. If you are venturing into areas with the possibility of these types of conditions it is a good idea to have a line led from the head of the sail to a block at the tack, with enough tail to get it to a winch on the mast. This makes it easy to winch the sail down should the need occur.

The new sail is then brought on deck, the bottom of the bag secured and the hanking/luff feeding process begun. With the boat still off the wind the process will be relatively simple. Be extra careful when reattaching the halyard to avoid wraps around the headstay and double-check sheet leads are not fouled.

If it is blowing hard it's a good idea to hoist in the lee of the main. Keep enough sheet tension so the sail can't get wrapped around the headstay.



This system of luff grommets and a venetian blind-type control line was first developed for the 12-meter class in early 1960s. Long since out of use, it still makes good sense for cruising boats heading offshore.

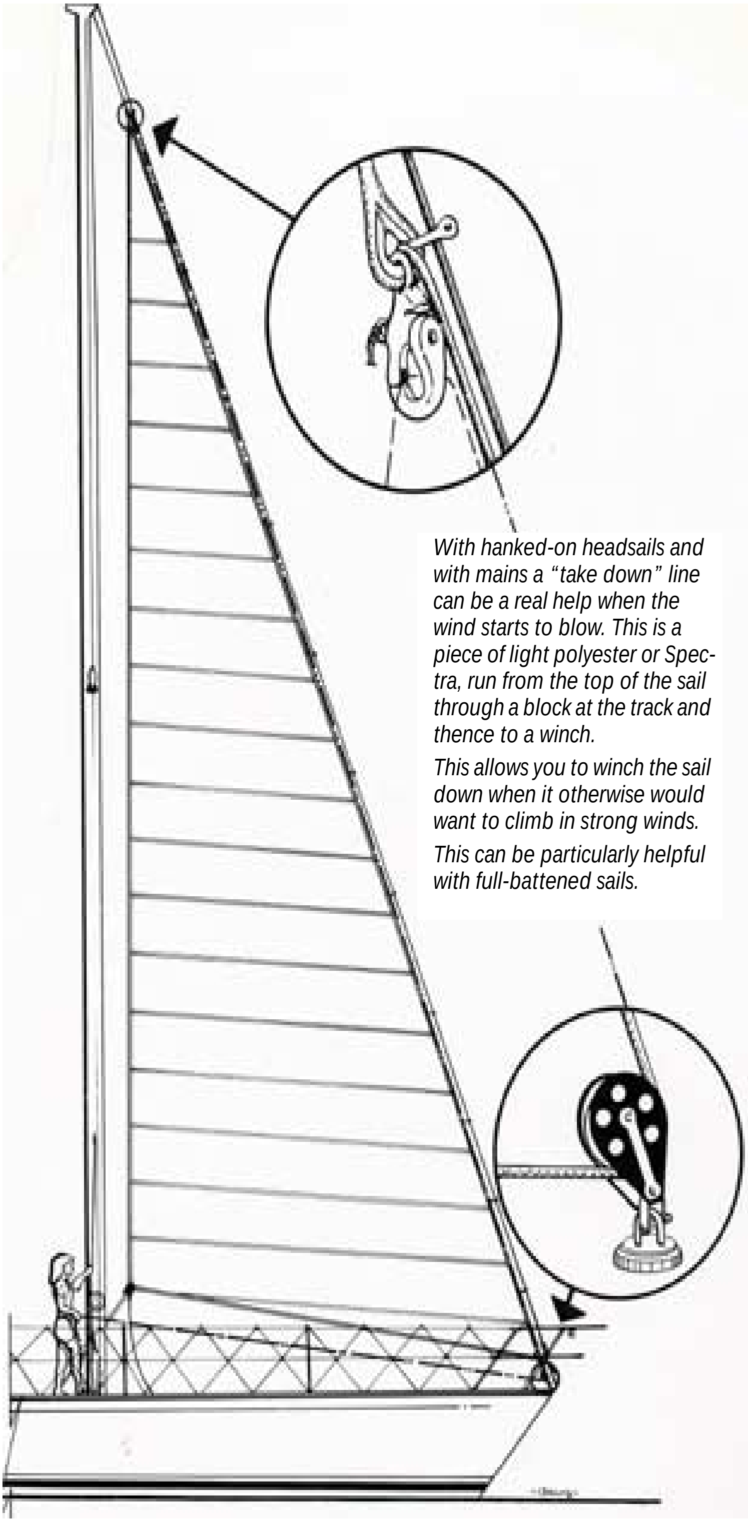
Changing Roller-Furled Jibs

The problem with changing a roller-furled type of jib is that it is only connected to the headstay with a bolt rope. This is okay if you've got several pairs of hands to help you out, but when it is just two of you what do you do?

The best procedure we've found is (again) to run off square, easing the main out all the way, and then dropping the jib in the lee of the mainsail.

The sheet is tightened and the tack is left attached until the sail is dropped and secured with sail ties.

If there are two of you to drop the sail it can be flaked as it exits from the feeder. Using a long, zippered sail bag to flake into saves all sorts of time and hassle. But you have to remember to lay out the bag and tie it



With hanked-on headsails and with mains a "take down" line can be a real help when the wind starts to blow. This is a piece of light polyester or Spectra, run from the top of the sail through a block at the track and thence to a winch.

This allows you to winch the sail down when it otherwise would want to climb in strong winds.

This can be particularly helpful with full-battened sails.

off before starting the process.

Another approach that does help is to have grommets sewn into the luff tape at about the same interval as hanks would occur. A light line is then run through the grommets, head to tack, and used to accordion the sail as it is dropped (this technique was developed with the first 12-meter luff groove systems). The grommets also provide a means of tieing the sail to the headstay in case of luff groove damage.

Upwind Foredeck Work

Now we're getting to the really distasteful part of cruising. We should admit right off that we hate to get wet. We don't even like putting on foul weather gear, so you can imagine our feelings about going forward to work when we're heading into a seaway.

Which brings up the first real decision. Do you really need to do this heading upwind? As we've just discussed, there is the alternative of running off and doing the work heading downwind in the lee of the main. Unless the concept of losing ground to leeward is too much to bear, this is the approach we usually take. If everything is ready a sail change can be accomplished in a couple of minutes and better a mile lost than a set of clothes doused in salt water!

On the other hand, if conditions dictate maintaining an upwind course there are a number of things that can be done to mitigate how wet you're going to get.

First is to slow down as much as possible. The slower you go, the fewer waves will come aboard during a given period and the softer (usually) will be your motion. Sometimes, altering course 10- or 15-degrees can have a big impact on dryness. Frequently, by pinching very close to the wind you can bring the speed down and waves more on the nose, but this takes careful helming to avoid getting into irons (and is worth practicing from time to time).

Finally, the cockpit crew can keep a wave watch and warn you when a big one is coming. This may allow time to scamper aft out of wet's way.

So much for strategic considerations. When the time comes to get a sail down the preparation is the same as when off the wind, you just want to move more quickly. And, as the halyard is eased the helmsman can help get the sail down and inboard with a quick luff that backs the sail across the foredeck (remember to crack the sheet just a bit so the sail won't hang up on the headstay due to sheet tension).

Because this luff is going to be quick (to avoid falling into irons) the halyard must run freely as the sail drops or is pulled down. Three or four gaskets will need to be thrown around the sail to quickly secure it until it is unhanked or flaked and gotten below. And as stated earlier, when removing the sail from the foredeck leave the sheets on until the last minute as a safety precaution.

Sail Overboard

What do you do if in spite of your best efforts a sail gets itself over the leeward side?

First, slow the boat down as much as possible. If you still can't get it back aboard, tack or jibe.

With the sail now on the windward side less will be in the water and the waves will tend to shove it back aboard.

If all else fails, one can always hoist the sail back into the air with the halyard.

Note: with a sail in the water take care with using the engine. Make sure neither the sail nor the sheets have fouled the prop.

Working the foredeck gets better with experience. You'll learn a system for each sail change, learn to anticipate a boarding wave, and when to turn your face to leeward to avoid a neck wash. It might not be fun, but at least the time spent forward will be minimized.

If a sail goes in the water:

- ❑ Know when to stop fighting. Don't let it drag you overboard.
- ❑ Wear your harness.
- ❑ Slow the boat down as much as possible.
- ❑ Tack or jibe to get the sail on the weather side.
- ❑ If all else fails, re-hoist the sail.
- ❑ Try and keep sail clear of keel, rudder, and prop.
- ❑ Do not put prop in gear unless you are 100-percent certain no lines or sails are in the vicinity!

Handling Running Rigging

Since we are dealing with sail controls the loads are proportional to sail size and the *square* of the wind strength. This means that the loads go up geometrically with increase in wind velocity. The ultimate load you will see is also a direct function of the boat's stability. The more stable the boat, the more upright it will sail and more load it puts on its running rigging. When changing up in size amongst similar designs sail loads can increase by the square of the increase in size as stability usually scales up as a second power function.

One would think that handling running rigging is very much a straightforward subject. However, with the proliferation of different types of rope construction and finish a lot has changed. In addition new types of winches and deck hardware continually evolve.

The work to be done is affected by the type of hardware used for control. With multiple purchases and heavily geared winches you can reduce the level of effort necessary to trim a sheet by a considerable amount. However, if the winch or tackle is used improperly, you can quickly see a huge increase in force.

This is typically more of a problem with a new crewmember than someone already familiar with your boat. However, a rapid change in wind pressure can catch you unaware, and then you will need to know what to do fast!

Avoid Overload

There is one basic fact to remember. Your hands are no substitute for a winch or cleat.

Let's say you are hoisting a spinnaker by hand. The load is light and you're jumping the halyard without a winch. The sail begins to fill and the halyard loads up. What do you do?

There are only two choices: flip a quick turn on the winch or let go. Otherwise, as the halyard starts to run through your hands you'll quickly end up with a serious burn, or, if you try to hang on, end up off the deck.

It is much better to take a hair more time and do the hoisting through a winch (or ratchet block) so that if a load comes on suddenly you can snub it off with mechanical advantage or the friction of something other than your precious skin.

Compare this stiff coil of Yale Maxibraid, a Spectra core polyester cover, to the all polyester line shown on the next page. Even although this has been in use for five years it is still stiff and more difficult to work.

Effects of Rope Construction

Traditional dual braid Dacron lines usually have a soft outer cover. These types of lines have good surface friction on the winch drum and have little tendency to snarl. They are easy on your hands, and except for a tendency to stretch under load, are a good all-around choice.

Many of the modern, low-stretch ropes such as Spectra and Vectran, have a more slippery surface and because they are so stiff are prone to twists and hockles when uncoiled. We've found these to be a pain to handle but wonderful in terms of stretch and longevity. With larger vessels they are the only way to go.

Bitter Ends

As mentioned previously, bitter ends on all running rigging, except spinnaker sheets and halyards, should have a figure-eight knot tied in to eliminate the possibility of a sheet or halyard being lost.

Help

Spinnaker sheets and halyards are typically left unknotted so they can be cast off in a hurry should a knock-down occur.

Coiling Lines

There are a number of different methods of coiling and tieing lines off. In all cases, the coiling should start from the loaded end, and then work down towards the bitter end of the sheet or halyard. This pushes any twists down the line.

Lines should always be coiled and tied off the same way throughout the boat. This way, you will know by instinct and feel how to handle all of the strings aboard.

Flaking

We've already discussed flaking sheets before a tack and halyards before a sail drop. The key thing is to do this in such a way that the line cannot jam or twist as it is running out.

The line in question should be flaked down in an area where it cannot catch on deck hardware or the corners of hatches. It goes without saying that it must not be underfoot.

There are several ways of flaking. The first is to use a figure-eight layout. The best direction of flake (clockwise or counterclockwise) depends on the construction of the rope. One direction will lay neatly while in the other you'll find resistance. Always flake in the easy direction.

There are lots of different ways to coil and secure lines. The important thing is to use one system everywhere on the boat, so there is never any confusion when trying to ease off a sheet or halyard.

These four photos show the system we've found practical. In the upper left we are finishing off a coil, securing it with three or four wraps (note that we always start coiling at the fixed winch or cleated end).

The next step (upper right) is to pass the coiled line through the top of the coil. Once this is pulled through (middle left) it can be dropped back over the coil itself to lock it off, or as in the bottom left photo, dropped over a winch or cleat.

Reminder: Sheets or halyards left loose on deck present hazards to your feet. If you stand on lines that have a load at one end, you are relying on cleats and winches to keep them in check. If something lets go in a hurry or a crewmember casts loose, your feet could be caught. It is better to stand clear of any loose lines (better yet make them up neatly as soon as possible).

When easing out a sheet or halyard which is highly loaded, if you just ease the sheet as in the top photo (our granddaughter Emma, aged two) the line will bind and jump. The best approach is to use your hand as a brake (below), holding the coils against the drum so it eases smoothly. The hand can also be used to help the line rotate around the drum.

Alternately, you can flake lines back and forth along the deck in a random manner, but making sure that the bitter end is on the bottom and the section closest to the winch is on top.

Using Manual Winches

All winch drums turn in a clockwise direction. This should be easy to remember, but we all seem to forget from time to time. If that happens, rather than thinking about it, it is usually faster to give the winch a quick turn to determine which direction is correct.

When you first start bringing a sheet or halyard in the loads are usually pretty light. The fewer the wraps on the drum, the less friction and the faster you can pull. It is much easier to pull a line when it is not in the self-tailing mechanism.

As the load begins to build you can toss on additional wraps (by flicking your wrist during the pulling motion) or stop pulling for an instant and methodically wrap the drum.

The number of wraps required is a function of line and drum friction along with sail loads. Generally, two wraps work in most situations for light loads. But you will want three to four as the breeze builds.

Be particularly careful in light, puffy weather. You may have just a single wrap so you can feel the sheet pressure. But then you've got to get more wraps on before the puffs load up the sails.

Easing under High Load

Under moderate loads, when you ease the sheets they usually run out smoothly around the winch drum (after taking off a few wraps of course). But, as loads build up, in some cases easing the line out of your hand results in the sheet binding on the winch drum, and then jumping loose in an uneven fashion. This is disconcerting and can be dangerous.

It is better to use your hand as a brake, pushing against the winch drum (and sometimes rotating the line counterclockwise to help it slip) with one hand while you ease with the other. This eliminates the uneven jumping, keeping the sheet smoothly under control.

Overrides

In theory, if you have correct leads to your winches you should not have overrides. However, as with most theories, this one does not always hold true.

A winch with an override (left) can create a real problem. If you stop cranking before the override has tightened, it can usually be pulled out. However, if the override is set under load you will need to unload the sheet. One method of doing this is with a sheetbend knot, tied on with a smaller diameter piece of high-strength line (right). Spectra or Vectran line is ideal for this purpose. The light line is tightened, releasing the load on the winch drum so that you can pull the override clear.

When you end up with an override the loaded line has effectively locked itself onto the winch. If you catch it early enough, you may be able to ease the wraps after the override until the override itself works off the drum.

If the override happens early in a maneuver and there is plenty of line left to crank in, you can work the override out by cranking it up the winch.

But usually both methods fail. In this case the only thing you can do is to unload the winch.

There are two possibilities for this. First, bring the lazy sheet around from the weather side of the boat to a secondary winch or across the cockpit to the windward primary winch.

Second, you can tie off to the sheet using a slightly lighter line and a series of rolling hitches, and then take this to another winch. Once it is tight (or the lazy sheet is cranked up) the override can be worked out.

Hockles and Twists

Some modern rope is very prone to hockles and twists when you take it off a winch. This is a function of the rope's torsional stiffness.

There are several things you can do to mitigate the problem. First, always tie off to cleats used after winches in a counterclockwise direction in other words, opposite the direction of the winch drum wraps.

Next, when tacking after taking off the first couple of turns on the winch ease out the first few feet

On Beowulf we've been using Yale Maxibraid for sheets and halyards. Shown here (above) is the mizzen halyard. This is 1/2-inch (12.6-millimeter) line and it is very stiff and prone to hockles. As the halyard is 2:1 purchase there is a lot of line and getting it cleanly flaked, without hockles, is a pain.

We've found that it is better to secure the coil with a piece of light line as shown here rather than coiling the line back on itself which makes even more hockles.

We always coil the line while it is on the jammer, and then put it on the winch. When we are ready to drop the sail, the line is removed from the winch (and held in the jammer). The coil is then rotated counterclockwise, against the direction of wraps on the winch, to try to even out any twists. After all of this is done, the line is then flaked out.

Help

Often there will be a single electric winch taking leads from other winches (or rope clutches). When this occurs use a minimum number of wraps on the manual winch commensurate with the loads and make sure that the lead to the electric winch is towards the base, from a down angle. Note in the photo above how the electric (right) winch is raised on a small upstand. This helps the lead from the manual winch.

of sheet before throwing the other wraps off.

One thing you can do with new rope to soften it and help get rid of construction twist is to drag it behind the boat for several hours.

Powered Winches

Powered winches are a wonderful aid to cruising. They help with hoisting, sheeting, and in particular going aloft. They are also a boon when you are kedging yourself off of a grounding.

When you use a manual winch the ability to do damage with it is limited by the gearing and the strength in your arms. It is rare that you can really break anything this way.

On the other hand, powered winches have the ability to wreak havoc if something gets stuck and the winch keeps pulling.

Electric winches are wonderful devices, but they have to be used with care.

Make sure you do not do what is shown in the photo beside (which is posed for the book).

Note how Linda is reaching over the winch for the power button, leaving both her short sleeve and possibly the line on her hat where they could be grabbed by the winch.

In general, do not wear loose clothing or have lines hanging from you (this includes safety harness tethers) when using a powered winch. If you cannot avoid the tether, make sure it is tucked out of the way. Do not lean over the winch when operating it. Rather, use your foot on the button from a safe distance.

Help

Here are a couple of things we've learned the hard way. First, always concentrate on what you are doing with the winch. Don't carry on conversations or try to do two things at once. Give the winch, and the work which it is doing, full attention.

Second, listen to the winch. It will slow down as the load increases. If you are raising a sail it may start off fast, then drop 20-percent or so in speed as you approach full hoist. We usually crank by hand for the last foot (300 millimeters) or so.

Make sure there are plenty of wraps on the drum, so the self-tailing mechanism isn't bent downward and overloaded (see photos on previous page).

The angle of the line-stripping mechanism on self-tailing winches is adjustable. The correct position varies with the way the lead(s) come into the winch. The unloaded end of the sheet or halyard should drop off the winch past the point where the loaded end enters the drum (top photo). This ensures that the loaded and unloaded ends will not cross and foul, which is particularly important on electric winches.

In the photo below note how the stripper is almost pointing at the loaded end of the sheet. As the line drops out of the stripper jaw, it falls across the loaded end. Eventually this loose line will be pulled into the winch, creating a huge mess!

Jammers and Clutches

Some of the new rope clutches are a marvel. They allow you to bleed off the line in question using just the clutch handle, hold an enormous amount of load, and don't seem to create a lot of chafe.

Older models of jammers, on the other hand, are really designed more for transferring loads rather than holding them for long periods of time.

If you have the older-style jammers keep an eye on chafe, and use them sparingly (we always transfer our loaded halyards to winches rather than leaving them on clutches or jammers).

Emergency Release

The time may come when you need instantaneous release of a loaded line due to an emergency (man overboard, rig failure, etc.). When this occurs there is rarely time to ease off the line. That's where a knife comes in.

On a highly loaded sheet or halyard all you need to do is just start to cut and the load, combined with the stress riser created by the cut, will have the sheet or halyard in two pieces.

We like to keep a couple of knives on deck just in case. One is strapped to the vang, or attached to the mast base. The other is near the helm.

Since these knives will be sitting in a wet scabbard, exposed to salt water most of their lives, they should be kept oiled. And, of course, you will want to keep them sharp!

Headsails which are free flying, like some reachers and spinnakers, tend to have a chafe problem at the mast head on their halyards. On long passages easing the halyards an inch or so (25 millimeters) several times a day will reduce the chances of the halyard breaking from this chafe.

Help

Knots

If there's one knot you need to be able to tie behind your back, on a pitching deck, in the dark, it is the bowline. While not as efficient structurally as some other knots, it has the advantage of being easy to open after having been loaded. When used to attach sheets or anchors be sure to seize the bitter end so that it can never flog itself open.

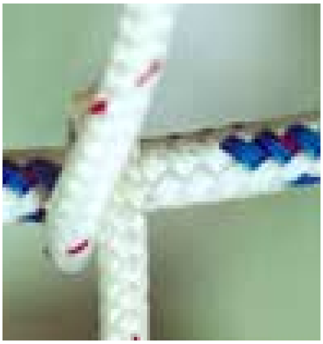
With the advent of new line materials and construction some thought needs to be given to the knots we use. The bowline is an old standard, with one overriding advantage—it is easy to untie after it has been loaded. However a bowline reduces rope strength by as much as 50-percent (a splice will get you almost 100-percent).

Phil Garland, probably the USA's foremost rigger tells us, "On Spectra under high loads, the knot creates heat somehow which causes the line to fail.When you look at the parted material, it looks like it was cut with a hot knife." Phil's preference is to use a knot first developed by Rod Stephens in the early 1930s.

Another knotty issue that often creeps up is the necessity of joining two pieces of line together—often of different diameters. In this case the sheetbend. In the following illustrations we'll show you a couple of the old standards, and a few unique knots which can be extremely helpful at times. As with everything else to do with seamanship, practice these from time to time.

When there's space the preferred system with bowlines it to take two passes through the clew or around the shackle (right photo). This reduces chafe at the connection point.

Help



A knot invented by Rod Stephens in the late 1920s (top three photos and middle right) has several advantages. First, it works much better with Spectra and Vectran type fibers. The strength reduction with this knot is less than a bowline.

Finally, it does not tend to unravel as does a bowline under some conditions.

The tugboat hitch (middle left and below), also called a trucker's hitch, provides a means of locking one line onto another. It can be used for tieing awnings, lashing gear, and most importantly, for relieving the load on a sheet or halyard when their is an override on a winch. A series of rolling hitches will also work.

This knot works best if the second line is a size or two smaller than the standing part. Where high loads are involved, as with freeing an override, a piece of Spectra or Vectran can be used. With its high strength and small diameter these lines are ideal.

Help

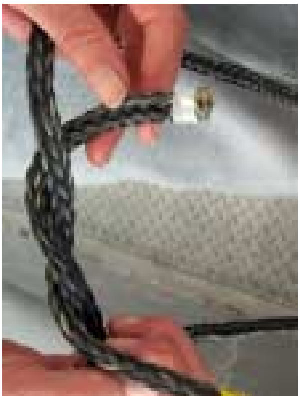




The sheetbend is one of the most helpful knots. It is used for joining two pieces of line and works particularly well with two pieces of unequal size.

Do not trust any other knot for joining lines as most will slip under load.

And while we're on the subject of knots the ubiquitous square knot (below) is handy for tieing reef cringles and in situations where several wraps of line are used around something, and then the ends need to be secured.



Using High-Tech Line as Shackles

In the olden days, back in the 60s and 70s when we were sailing high performance catamarans, it was common to use line rather than shackles or turnbuckles to hold things together.

We found this approach lighter, less costly, and infinitely easier than trying to dig out exactly the right piece of hardware.

As we got into monohull cruising this mindset faded. *Intermezzo*, our first cruiser, came to us with a box of shackles and we used them.

Twenty-five years later, however, on *Beowulf*, we are back to the old system. The advent of the high-strength lines like Spectra and Vectran have made this possible. If you visit with us aboard *Beowulf*, you will find line used to attach everything from vangs to the lifeline system. We feel this approach is more reliable than using shackles, lighter, and yes, less costly. The same approach has taken hold in the racing fleet as well.

Three examples from Beowulf of using Spectra line in lieu of shackles. Top right is the mizzen genoa sheet block. Lower right is the attachment to the upper lifeline (also Spectra) to one of the pulpits. On the left is how we connect the rail vangs on the mainsail.

Help

Rope End Details

How running rigging is terminated tells a lot about the rigger or the boat's owner. When ends are made up neatly, with sewn whippings or flemish eyes they tend to stay neat and avoid unraveling. It is a sign of a conscientious sailor.

On the other hand, you can always tape the ends, or burn them with a hot knife (or a match). But these approaches end up coming undone, making a mess in the process. If you happen to need to run a new sheet or guy during a bouncy night, and the end is all fluffed up, this becomes a safety issue.

Sewing on a whipping is a simple task which can be accomplished in a minute or two. Start with heavy waxed twine and a sharp needle. Put a figure-eight knot in the end of the twine, and then push the needle through the body of the rope, snugging up the knot against the outer cover (upper left). Make three or four tight wraps around the rope (upper right) and then take the needle through the body and cinch it tight. Bring the needle across the wraps and back through the body (middle left), and then make a couple more lengthwise seizings to keep the wrapping intact (middle right). Finish off with a half hitch around a strand of the rope and bury the end. The finished whipping will look like the lower left photo—neat, and it will be there forever.

Making a flemish eye with double braid is quite simple. Start by pulling a fid length of core out of the cover, taping it and cutting it off. Then take the cover (shown beside—right photo) slip it into the fid body, tape it in place, and slide the fid into the empty jacket as shown below.

Sets of fids which are handy for splicing, too, can be purchased in just about any marine store.

Pull the fid through the cover and cut off the excess.

The eye is then bound with a sewn whipping.

While this is not a structural loop in the sense of a proper eye splice, having flemish eyes on reef pennants and halyard ends makes it easy to reeve new line by tying on a messenger line to the eye.

Help

GOING ALOFT

Intermezzo, broad reaching in the trades, heading for Fiji. One of the problems with going aloft is that the view is so spectacular it is hard to remember you are up the mast to check on things and maybe do some work.

On Intermezzo, because of the age of her rig, we made it a habit to go aloft every third day to check on things. Only once did this yield results—but that probably saved the rig.

On our newer boats we check the rig before every *pas-sage.*

Going aloft should be a regular part of your preventive maintenance routine. By keeping a regular check on the rig you will be able to catch incipient problems, before they create major disasters, and once you've gotten used to being up in the air, you will find the view absolutely breathtaking.

Overcoming Anxiety

Learning to work aloft is not unlike taking your first scuba diving lessons. Neophyte divers, if they are at all anxious, will use a large amount of air and emerge from an easy dive exhausted because of anxiety. The same happens aloft. If you are tense and hanging on for dear life, you will find it more difficult to work aloft, and you will tire quickly. Familiarity and paying attention to some basic rules are the keys to overcoming the problem of fear.

You must be in good physical condition. Working aloft in port can call on a fair amount of exertion. If something does go wrong, your life may depend on your muscles. Working aloft at sea definitely requires strength and dexterity.

Bo's'un's Chair

The bo's'un's chair (or climber's seat) needs to be sturdy, fail-safe in construction, and provide you with a comfortable, secure platform.

It can be as simple as a piece of one-inch (25-millimeter) plywood, with holes in the four corners. Half-inch (12.6-millimeter) line is then made

Help

into a sling, crossing under the seat, and attached to a halyard.

Of course there are pre-made chairs too. These are usually built from some sort of fabric. It is best if they have a webbing sewn on the outside of the fabric to act as a safety in case of a fabric tear.

Many professional riggers like a climbing harness, in effect a pair of tight fitting pants you slip on with a built-in harness.

If you are choosing a pre-made seat, make sure the pockets are loose when you examine the seat as pockets tend to tighten when you are sitting in the chair.

The back should be adjustable, so that you can get your rear end well over the back edge. An adjustable crotch strap is also a nice feature to keep you from slipping through the front.

Secondary Support

Some people like a secondary means of support. Usually this entails a safety harness which is attached to a lazy halyard. This system requires a second set of hands on deck to tend the extra halyard.

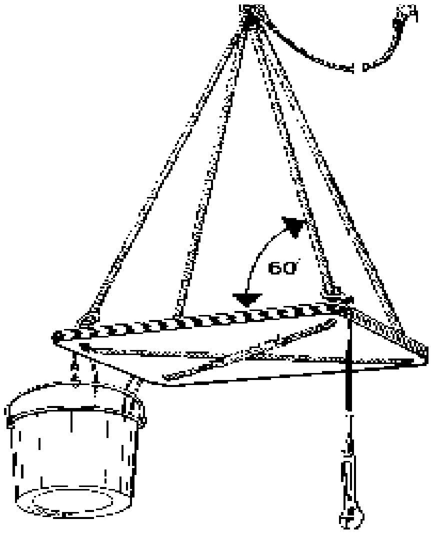
While we have tried this approach, we find it takes too much time. For our own purposes, when working aloft we stay with a single halyard, but tie off the chair with a safety line at each work point. This line is usually a six-foot (1.8-meter) tether with a snap shackle on the end.

What to Take

Going aloft requires a substantial amount of crew energy (unless there's a windlass or electric winch in the equation), so you want to make the trip as efficient as possible.

If it is just an inspection trip we take duct tape, silicone, spare cotter keys, a knife, pliers, a magnifying glass, seizing wire, and a spray can of Teflon lubricant for sheaves and mainsail track.

If there is a major maintenance project, we will try to think through



A bo's'un's chair can be as simple as a piece of one-inch (25.4-millimeter) plywood with the lifting sling crossed underneath; or more sophisticated like the West Marine chair (below) which we now use.

The latter chair keeps you from slipping out with a back and crotch strap, and has an array of handy pockets.

Be sure to tie off any tools being used aloft, and keep the crew out of the path of anything that might be dropped (taking into account heel and wind). A medium-sized pair of pliers or wrench will have enough force by the time it hits the deck to severely damage a crewmember's skull!

Below, we now use a West Marine bo's'un's chair. With its many pockets and padded seat, it is very convenient.

Basic items to take aloft: duct tape, rigging tape and sealing tape (which we use over the others to seal the edges). Silicone is used for bolt heads and exposed cotter keys. The stranded seizing wire is used on shackles and spreader tips. We've found Super Lube to be the best compromise for our sail tracks.

It is safer to go aloft on a knotted halyard rather than attached with a shackle. With a shackle, there is always a small danger of it catching on something and opening.

If you do go aloft with a snap shackle (right photo), take the plunger lanyard and tie it back so the plunger cannot accidently open. With a D-shackle, always seize the pin.

It often helps to secure a line from the head of the chair to a tightly fixed halyard. We do this with a snap-shackle. This limits the amount the chair can swing away from the mast—especially helpful at sea.

each step before going aloft, and then make sure to have *all* of the tools required.

Storage of tools is usually a problem. Items like drills or hammers are typically tied to the chair so they can be left dangling. We will frequently tie a bucket to the chair into which both secured and loose items are stored.

Finally, if I am going to be up the mast on a big project we drop a light messenger line to the deck so that we can hoist up forgotten supplies.

Is the Spar Secure?

Keel-stepped spars have a fair amount of leeway as to what is necessary to keep them standing when someone is aloft. Deck-stepped spars, on the other hand, have no margin for error.

In either case, make a quick check of all deck fittings to be sure that things are in order before going aloft.

Setting up Halyards

It is usually best to work with a headsail halyard. Obviously, you will want to know that whatever it is you are hanging on is in good condition, without hidden chafe on the inside of the mast.

If there is any doubt about this, or about any splices, pull the halyard out with a messenger line and inspect it first.

Avoid using reel winches for going aloft as they have unpredictable brakes.

Halyards can be tested by pre-tensioning them on a winch.

It is always better to use a bowline knot rather than a shackle when possible. If you must use a

Help

shackle, be sure that the pin is tightened with a wrench, or, if it is a snap shackle, tie a lanyard around the body so that the pin cannot accidently open if it catches.

When you are being cranked up by hand, try to lead the halyard to one of the cockpit primary winches. The extra gearing available here will make the deck crew's job much easier.

Even better, use a powered winch or windlass to go aloft (this is one of the best reasons to have a power windlass). In all cases, make sure the lead is fair to the winch and coming at the drum from at least an 8-degree down angle (to avoid overrides).

If you are going aloft at sea, or in a rolly anchorage, take a lazy halyard and set it up tight in front of the mast. You can then hold or clip onto this halyard to keep your body from swinging.

A climbing harness (above) is more secure than a chair. Note the tensioned halyard (white arrow) which makes a great handhold. At sea, we typically clip onto the tensioned halyard, using it like a jackstay, to prevent swinging away from the boat as we roll in the seas.

Motion Aloft

Any motion you feel on deck is magnified aloft. The magnification factor is a function of height. Where you would hardly notice a small boat wake on deck it may set you swinging wildly at the mast head.

Also, your weight aloft will magnify the effects of wakes (or seas) and make the yacht considerably more tender when sailing.

Turning Blocks

In many situations you may find the halyard you are riding must go through a turning or snatch block at the base of the mast, before running to a winch. If this is the case, *make absolutely certain that the block is properly closed and secured.*

If working on the headstay is required, typically on the furler joints, the same lazy halyard approach can be used to provide some security. In this case the halyard is secured just forward of the headstay, and then winched very tight. A short strap from the top of the chair is attached to hold the person aloft from swinging back to the mast.

Safety check list:

- ❏ Standing rigging secured so mast is stable.
- ❏ Halyard checked for chafe or tensioned with a winch.
- ❏ Halyard fastened with bowline.
- ❏ Seize any shackles used.
- ❏ Tie tools to bo's'un's chair.
- ❏ Keep crew clear below allowing for windage and heel.
- ❏ Reduce extraneous noise (no music or outside conversations) so deck crew can concentrate on man aloft.
- ❏ Use a lazy halyard as jack line to prevent swinging.
- ❏ Use a safety halyard to chest harness or secure chair to each working point.
- ❏ Do not use reel-type wire halyard winches.
- ❏ Make sure any snatch blocks are properly attached and closed.
- ❏ Advise crew aloft of any wakes or larger than normal seas.
- ❏ Lead to winch must be fair. At least 8-degree down angle to prevent overrides.

Pre-Planning

Having a plan in advance of what the goals are is a good idea. Even better is to discuss this in detail with the hoisting crew. This discussion should cover not only the work to be done, but how you are to be hoisted and lowered, and where the stops will be.

Hoisting

As you are heading aloft if you pull yourself up on the brace halyard each time the crew pulls or cranks, their job will be much easier.

The hoist crew will need to be aware of obstacles which you must maneuver around on your way aloft. These usually include spreaders and cutter stays.

With an electric winch the deck crew and person aloft will need to be careful with communication as there will be quite a bit of ambient noise over which you must be heard.

On Your Own

At some point it may become necessary to go aloft on your own. If you have mast steps, this is pretty straightforward. Remember to use a safety harness and clip on from time to time as you move up the rig.

Another approach is to use a block and tackle. Good quality dinghy blocks, with a four- or five-to-one purchase make the job pretty straightforward, and surprisingly easy.

There are two keys. First, use a large diameter line which is easy on your hands. Our preference is for 7/16-inch (11-millimeter). Second, have a ratchet block in the system. This will take most of the load when you are resting between pulls.

Working up the Mast

In smooth water, with no mainsail set, working aloft is typically a case of securing your legs around the mast leaving your hands free.

If the main is set, one hand (at least) will need to be used for hanging on. As stated earlier, use a safety tether to secure the chair at each work stop.

Do things in slow, precise steps. Do not rush. Take care withdrawing and replacing tools to minimize the risk of dropping something.

Keep an eye out for any passing boat wakes. This will give you time to stop what you are doing and hang on with both hands until the wake passes.

At the Masthead

Working on the masthead itself is possibly the most difficult chore aloft. The bo's'un's chair can come within only a few feet (400 to 600 millimeter) of the top, so you are forced to stretch. It may be necessary drop back down to the deck and shorten the lifting sling on the chair to get you close enough. Be wary of standing in or scrambling out of the chair to do the job. A bo's'un's chair is most difficult to get back into!

The deck crew should remember that the crew aloft will tire quickly. It requires a lot of effort just to hang on, let alone perform the tasks at hand.

Deck Crew

You will want to be sure that the person who is cranking you up knows how to operate a winch properly (your life may depend on this). If there is any doubt, wait until you have someone to do the job in whom you have confidence.

The deck crew needs to pay close attention to the person up the spar. They should not listen to music, talk with others, or read as the person aloft will be difficult to hear in the best of conditions.

Stay clear of the work area, in case anything is dropped.

Communicating from Aloft

You can safely assume that it will be difficult to communicate with the deck. So, using short, unambiguous commands is the best approach.

We find that simple one word commands, such as "up," "down," and "hold" are best. Sometimes hand signals work as well.

Theoretically, a small walky-talky with a headset would be ideal, but we've never tried this (although we've talked about it).

Coming Down

The odds are you will be tired on your way down, so you need to be extra careful to hold on tight.

The deck crew should make this trip as fast and smooth as possible. This is not always easy.

Several wraps will need to be removed from the winch to allow the halyard to slip smoothly around the winch drum. One hand is used as a brake sandwiching the line to the drum, while the other hand controls the tail of the halyard.

If everything is just right, you should be able to let the tail slip through the one hand while speed is controlled with the brake hand.

Sometimes the tail hand must feed the halyard into the winch.

While this is happening make sure that feed hand is kept low enough in relationship to the wraps so that an override cannot occur.

Keep in mind that the legs of the person aloft may take a minute or two to regain circulation when they are back down on deck, especially if the trip aloft has been a long one. We slow down the rate of descent so the last bit is quite slow and we can use the chair for support for a moment when our feet first hit the deck.

Dealing with an Override

Mishandling the tail to the winch can quickly lead to an override. If an override does occur, the crew aloft will have to take his or her weight off the halyard until the override is cleared, a most annoying procedure at best.

One way of doing this is to snug the safety line off the chair, and then pick up your own weight with your arms and/or legs. If there are halyard jammers a bit of slack can be pulled down and then the jammer can be used to hold the load while the winch is cleared.

Finally, if there are no jammers and the person aloft is in a location where it is impossible to secure him or herself, a series of hitches from a

Things for the deck crew to remember:

- ❑ Watch the winch to make sure the lead is fair, that no overrides can occur, and that wraps cannot jump off the drum.
- ❑ Concentrate on the job at hand. Do not carry on conversations with others. Insist it be quiet aboard.
- ❑ Be alert to where the crew is on the mast and the obstacles they are facing. At the intersection of stays and spreaders you may have to stop or slow down to allow time to exchange hand holds.
- ❑ When lowering try and do it quickly and smoothly. Keep in mind it is harder for the crew aloft to hold on when they are being lowered.
- ❑ Be careful not to overhoist. Pulling the wire swage fitting or knot into the sheave can cause it to jam or beak.
- ❑ Take care with the last few feet of lowering. It may take a minute for the crew to gain their balance when down at deck level.

Help

Some form of restraint to keep you from sliding out of the chair is a good idea. Our West Marine chair has an adjustable crotch strap. This needs to be cinched tight once your feet are off the ground and your body weight is well distributed on the seat.

Making sure any snatch blocks are totally closed is a major safety factor. If the block opens accidently, you drop—something we learned the hard way! Always double-check that the catch (lower photo) is secure.

The deck crew needs to develop the correct lowering technique, using the appropriate amount of wraps on the winch. This varies with winch size, drum surface, rope construction and size. We normally use between three and four wraps. One hand is used to feed the halyard onto the drum while the other helps the line rotate smoothly—actually gives the loose line a bit of a push in the correct direction (you can also use this hand as a brake). The object of this is a quick, smooth ride back down to the deck.

secondary line to the halyard will need to be taken to another winch to unload the halyard.

At Sea

Obviously going aloft at sea brings with it an increase in risk factors from the vessel's motion. Still, it may be necessary at some point.

If you are comfortable working aloft it may be a good idea to make a quick check of the rig every three or four days.

When I go aloft at sea it is either with the boat going downwind, where motion is moderate, or we heave to for the time I am off the deck.

Wearing padded clothes (both shirts and long pants) will reduce bruises.

As we stated earlier, setting up a lazy halyard onto which you can clip the chair gives you a means of control.

It is always better to work up the windward side of the spar as gravity then pushes you against the mast section.

Once you are aloft take a moment to look around at the view. You will find it spectacular beyond anything you can imagine on deck. In fact, if you are like me, you will find the view quite addicting!

Help

Communicating on Deck

One of the most difficult problems that arises when sailing shorthanded is communication between the cockpit and foredeck.

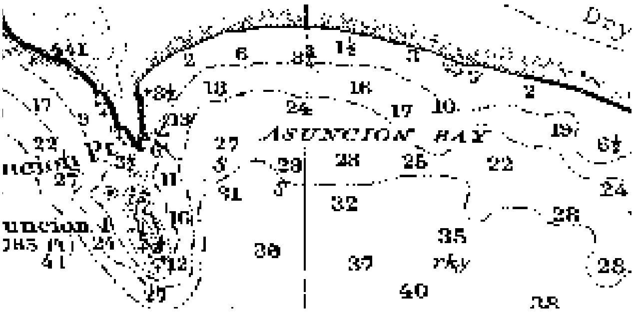
Just how difficult it can be was brought home to us in a forceful manner one blustery morning off Baja California. A southeasterly gale had sprung up without warning, leaving us on an exposed lee shore.

We were most anxious to get the anchor up and put some sea room between ourselves and the coast.

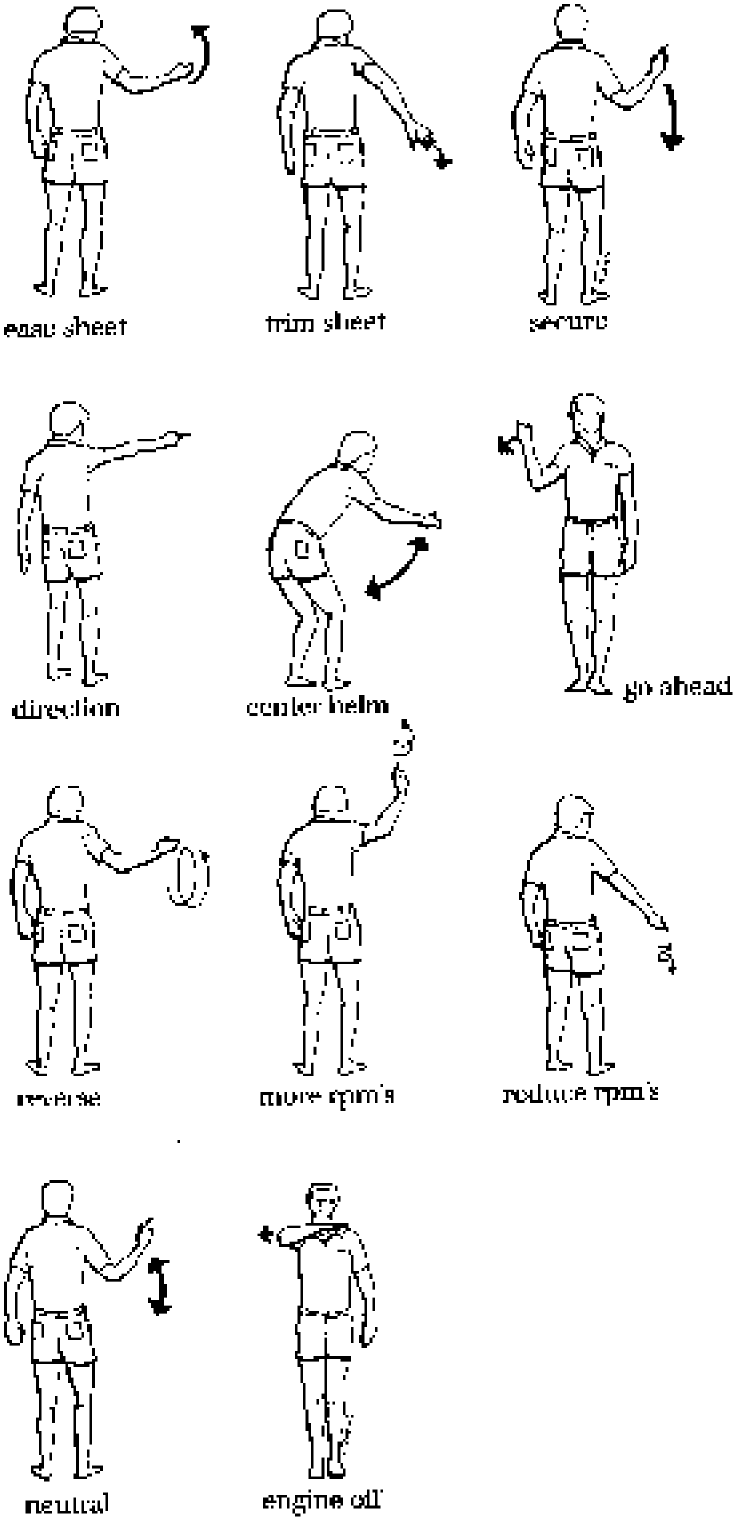
Because of the 40-knots of wind and the rising sea, we had to resort to engine power to bring *Intermezzo* forward on her chain. As the wind would blow her bow off, Linda, at the helm, would correct with the rudder. Since she couldn't see the chain angle from her position, I had to direct her from my position at the bow. She had to play the throttle constantly in the gusts and waves to bring us slowly ahead, yet not override the chain. It was a real balancing act.

At the bow it was my job to watch the chain coming aboard and control the anchor windlass while at the same time trying to shout aft to Linda to head to starboard, speed up, turn to port, slow down, and so on. Because I was facing forward most of the time, Linda could rarely hear what I was saying above the wind and engine noise. There was con-

Linda Gerber gives her husband Tony the direction to head as they pick up their anchor. They are about to head back to San Francisco from Hanalei Bay on the Island of Kauai.



Asuncion Bay, on Baja California's West Coast is a nicely protected anchorage most of the time. But if a front passes by, you are totally exposed to southerly winds, as you can see from this chart. And that's what caught us. The front came through in the early morning hours. Rather than leave immediately, the moment we felt the wind shift, we waited for daylight. Not a smart thing to do! We got out okay, but just barely.



siderable confusion between us.

That we were able to get the anchor aboard safely and work out to sea was due more to luck than good seamanship. That our marriage and cruising plans survived was a miracle!

That experience convinced us to work out a system of communicating by hand signals, and we eventually came to use three types. Our anchoring, sail trim, and docking procedures all benefitted. Anyone who has watched a crane being operated on a construction site will recognize some of the signals used.

Steering under Power

To direct steering under power we hold an arm out straight athwartships to tell the person at the helm to head in the direction the arm is pointing. To request that the helm be centered and that we move forward, we swing the arm fore and aft along the centerline. To indicate reverse, we put our palm up facing the helm and motion aft. A horizontal rotating motion of the forearm and hand indicates come ahead. To ask for increased engine

Help

rpms, we spiral our forefinger upwards in a circular motion. Just the opposite, the finger spiraled towards the deck, means slow down. A vertical series of chops with the hand facing outboard means put the engine in neutral. When everything is secured the universal cut across the throat tells the helm to shut down the engine.

Sail Trim Signals

For quiet sail trimming, we use a modified version of our steering signals. Circular motion of the arm and hand indicates ease the sheet. A palm facing aft with a pushing motion means trim, and a vertical chop says secure.

Docking Signals

Docking requires the helm to signal the line handlers. We normally have a bow line, two springs, and a stern line to throw. The helmsman holds up one finger for the bow and gives a wave when he or she wants the bow line to be tossed. The bow spring gets two fingers, the stern spring three, and the stern line four.

At Night

If you don't have deck illumination or if you are trying to protect your night vision by using minimum light, these signals can also be adapted for use with a flashlight. Pointing to port or starboard indicates turning direction. Swinging the light fore and aft on the centerline means steer ahead. Power forward is indicated by a series of quick flashes aimed aft-but not directly at the person steering. Speed up is a spiral motion upwards with the light, and slow down is a spiral motion aimed at the deck. Engine neutral is another sequence of flashes aimed aft.

Concentration Is Required

From time to time we had problems with the person aft at the controls missing signals because his or her attention was elsewhere. When you are depending upon hand signals to complete a task, it is obviously important that both parties maintain concentration. Hand signals, ours or your own variation, are not difficult to learn or to employ. In fact, what is necessary are a few practice sessions with your crew without the pressure of actual need or an anchorage of bystanders. An orderly, well-organized, and quiet ship is the result.

While our original impetus to develop a system of hand signals was a situation in which the wind made it impossible to communicate, over the years signaling rather than shouting became a habit, and we did it even in calm weather.

As long as you consider what problems can arise as a result of your sailing shorthanded and think out in advance a reasonable means of coping with them, there is, in our opinion, no pressing reason to take crew.

Staying Fit

Before we close this section on working the boat a few comments are probably in order about staying fit.

For the most part when you head to sea the physical requirements are low. We've got roller-furling, ball-bearing blocks, and geared winches (not to mention powered winches, too) all of which reduce the physical requirements on the crew.

But when something goes wrong, your safety may then depend on your physical dexterity and strength. Being fit also benefits you in heavy weather, where your physical stamina may make the difference between success and failure. And heaven forbid that someone goes overboard the degree of fitness of the person in the water and the rest of the crew becomes a life-or-death situation.

As the boats get bigger the opportunity to stay fit from the inherent movement of the boat—isometric exercise—diminish. To get around this problem on Beowulf we use a stationary bike. We purchased this Schwinn and removed the steel base. A piece of marine ply was subsubstituted. We use this on deck or in the engine room.

When we started cruising we were both pretty fit from racing small boats and working out on a regular basis. But once we got aboard formal work-outs stopped. Except for rowing the dinghy, and grinding the odd winch, there wasn't much going on to keep us fit. We stayed trim enough due to the isometric exercise when we were at sea. In those days, with the hubris of youth, we just didn't concern ourselves with physical conditioning.

Fast forward a couple of decades, now sailing really comfortable boats, with power winches, and the situation gets serious. We've found that unless we actively pursue staying fit, we're not capable of safely handling the unusual situations which may come up from time to time.

The very best approach to working out is to have a trainer visit your boat, and then help to come up with creative ideas for staying in shape aboard.

On Shore

When we're on shore we work out twice a week with free weights and/or with gym equipment. In addition, using a treadmill or long brisk walks, we try to maintain our cardiovascular fitness. We've found using a trainer occasionally at a gym really helps motivation and technique. Linda also takes yoga classes two or three times a week.

Between the two of us, Linda likes to exercise. Steve on the other hand hates it—but partakes none-the-less because he knows if he doesn't, we'll end up needing crew at some point.

On Board

Exercise takes creativity on board. With *Beowulf* we have the luxury of enough space for a stationary bike—which gets used several times a week. We also have a rowing dink which is excellent exercise. But our favorite means of getting a cardiovascular workout is with long walks ashore. We also carry nesting weights. These are efficient in terms of space and weight, and allow almost the same workout you can get in a gym.

A walk through any large sporting goods store will yield a potpourri of exercise devices. One of our favorites is the "Bullworker." This is a pipe/shock cord affair which helps with a large range of muscles. If you don't have space or the inclination to carry nesting weights, try one of these shock cord-powered devices.

Even without weights you can get a pretty good workout aboard. You can do push-ups, a variety of sit-ups, dips, deep knee bends, and stretches all of which are highly beneficial.

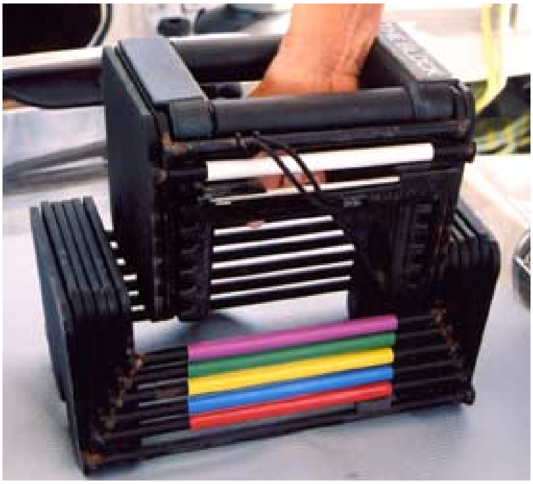
We've also seen folks who will take a halyard, snatch block, and some miscellaneous gear to create various resistance "machines" from basic boat gear.

Swimming and diving is also an excellent work out.

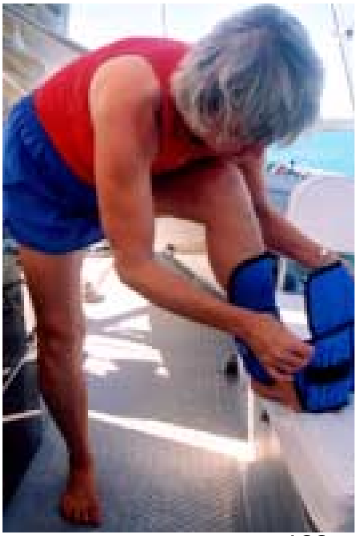
Keeping Track

Unless you are one of the strange breed who are really into exercise it is going to be tough to keep up a program once you are aboard. There are just too many distractions. The one approach we've found that works really well is to keep a log.

This written record works as an incentive to keep at it. When you miss for a while, the empty square on the page stares back at you. Once you get into a program, and stay with it, you will feel better physically and mentally, and your boat handling will benefit too.



The "Power Block" is a series of nesting weights (this one goes from 15 to 50 pounds). These are compact and easy to use aboard (or at home). In the photo below Linda is using 20 pounds for one arm rows.



Legs are difficult to keep in shape aboard. A couple of sets of leg weights as shown beside will go a long way toward keeping your leg muscles toned

We met Patty and Randy Hunter at a Seven Seas Cruising Association get-together in Esboro, Maine. Pretty soon Patty, Linda, and another friend, long time cruiser Jane de Ridder were talking about staying in shape, and bragging about what they could each do. Patty and Randy were kind enough the next day to demonstrate how they use the confined space of their Hylas 44 for working out.

The Hunters use their after deck for doing sit ups. There are, of course, a whole variety of abdomen and leg exercises which can be done in this manner. Patty shows just a couple. Above, alternating elbow to knee. Middle, straight sit-ups (or crunches). Below left fanny lifts, and lower right, more ab work.

Help

The radar arch or handholds below are excellent for chinning and hanging abdomen exercises. Depending on how fit you are to start, it may be helpful to start with a spotter (lower left photo). This allows you to work up to the full weight of your body. Push-ups can be done on deck (middle) or below. Again, just starting out, a spotter to help with the load may be helpful. The companionway (below) works well for dips. These are hard at the start, and you may want another crew to spot you as you build up arm strength (by giving support to your legs).

Skip Allen

We've known Skip Allen since he was a teenager. He and Steve grew up sailing small boats in Newport Beach, California. While Skip was still in high school he was one of the top Star boat racers in the country—a remarkable feat in itself. In 1967, sailing the family Cal 40, he and some friends won the Transpacific Yacht Race to Honolulu, giving notice of things to come.

We asked Skip Allen what he'd learned from the 1979 Fastnet Race. "Don't break the boat. We never stopped racing, and didn't realize other boats were having trouble. After rounding the Fastnet Rock in 40-50 knots of wind, we took the big seas, 20-40 feet, on our quarter, broad reaching at 2/3's speed (6-8 knots) under triple reef main and later the number 4."

That was obviously a long time ago, and in the interim Skip has made his living as a consultant to those wanting to learn about the sea—from cruising to winning races. This includes coaching, especially on navigation, weather, and boat outfitting

In the course of sailing all over the world he's racked up over 200,000 miles of ocean time, 25,000 of this cruising or racing single-handed. Skip's 100,000 miles of racing experience includes the 1979 Fastnet aboard *Imp*, and then there's another 75,000 miles of coastal and offshore cruising on a crewed basis. He has crossed an ocean more than 40 times including a single-handed cruise to French Polynesia and back, and another to New Zealand and back.

When Skip isn't consulting, delivering, or racing other folk's boats you will find him cruising aboard his Wylie 27, *Wildflower*. This is the smallest boat Skip felt he could cruise offshore, and he launched her in 1975. Through 1982 he sailed without an engine, then added a 7-horsepower diesel which burns soy fuel. A removable cutter stay converts the boat to cutter rig for offshore work. He uses jib hanks rather than roller-furling. Solar panels provide power, there's no refrigeration, and steering is via Sailomat wind vane or Autohelm tiller pilot (he carries two Autohelms and one old Tillermaster).

Single-handed Issues

We were curious to learn how Skip handled watch-standing on his passages. Skip's approach:

The next time you think you need to wait another couple of years to make more money to go cruising on a bigger boat think about this. Skip and Wildflower have been together for more than 50,000 miles since 1975.

Offshore the motion makes me have to pee every hour, so that wakes me. I sleep with an egg timer on my chest and radar alarm velcroed to my beard when coastwise or in traffic situations. Offshore I broadcast my position on VHF 16 every hour and leave the radio on. When not standing watch at night I run a masthead tricolor (LED tricolor bulb by Deepcreek Designs, uses 100 milliamps), with a strobe and 2 red bicycle LED lights on a windsurfer mast stepped on the stern. Offshore, I don't care about COLREGs lighting, which I consider totally inadequate for small boats. I just want to be seen. I sleep with one arm around my raft and the other around my ditch bag, containing EPIRB.

And about staying aboard he had this to say:

My lifelines are 28-inches (711-millimeters) high secured through solid aluminum stanchions in sockets through the deck. I am tethered to a length of webbing half the length of

Help

the boat, which is secured amidships, allowing movement anywhere on the boat including below, without having to unclip.

Weather

Skip is trained in meteorology. His approach:

I gather as much info beforehand as possible about the area to be visited. I collect weatherfax on my ham radio. I make my own decisions, and do not rely on routers or shoreside advisors.

As to heavy weather tactics Skip feels that confidence in your boat and self is the best preparation.

When You Are Just Starting Out

Just starting out, the best thing is to go to sea with an experienced skipper, whether it be a delivery, a short cruise, or a longer passage. There is no substitute for hands-on experience. Keep a notebook or log, especially of lessons learned. I have my logs dating back to 1957 and still refer to them before setting off. Don't be afraid of making mistakes. That is how one learns. "I'm sorry," has no place offshore. Rather, "Would you please show me how to do this correctly?" is the right response to any vexing difficulty or new situation.

Seamanship is a life-long learning experience. Be open to new ideas while not discarding tried and true methods. Learn from doing rather than from a book or magazines. Every boat, every passage, every crew is different. What works for one crew may not work for another. Spend less time below on the computer, and more time upstairs looking out, especially on coastwise passages.

When things are calm, play the "what if" game with your crew. Go over every possible "what if" situation you can think of, and how you would react.

An example of this approach paid off in the '95 Transpac. With 20 miles to go to the Diamond Head finish, the 68-foot (20.7-meter) sloop *Cheval* jibed abeam of Ilio Point, Molokai. Unfortunately, the permanent backstay tail was led through a rope clutch and not onto a winch. The strain on the rig during the jibe stripped the cover off the backstay tail inside the rope clutch, and the backstay failed, sending the 85-foot (26-meter) mast over the bow. Momentarily stunned, the crew didn't miss a beat and immediately recovered their composure to pull all the pins on the rigging and let the mast sink. They then hoisted their spinnaker pole in place of the mast, set a couple of jibs sideways, and were underway in 20 minutes, doing 8-10 knots, to win the race...I was not aboard *Cheval*, but aboard *Pyewacket*, 30-miles astern.

Masts do go over the side at sea. But something can almost always be used for a jury rig, and it is worth thinking about "what if" your rig tumbled. Can you pull your rigging pins quickly? What would your jury rig look like? I've experienced six dismastings at sea, and only once were we able to recover the broken rig. Broken masts quickly fill with water and sink, and it can be very difficult to make a recovery without seriously damaging the hull.

"Regarding safety, I discuss the issues at dockside. Then we go out in the ocean off Santa Cruz Harbor and practice until perfect. This includes man overboard drills, fire, abandon ship, etc. "I have been involved in three real MOBs, all successful recoveries.

"The boat is my home and office, so I continually am checking all the systems. That said, boat owners can be blind to problems as they don't want to see things that make their baby less than perfect." In other words, stay ahead of the maintenance work."

"Other than falling overboard, the two most dangerous things aboard a boat are being hit by the boom and falling down the companionway or an open hatch. Use a boom preventer when off the wind."

WATCHKEEPING

On most cruises the majority of our voyages are short enough that a formal watch system is not required. The typical trip lasts no more than six to eight hours. Usually, both skipper and crew will be awake during the passage. If the captain needs an afternoon nap to assist in the transition from a hectic week ashore to the more civilized lifestyle afloat, it can be accomplished without difficulty.

As voyages lengthen to an overnight run, or a passage of several days, the watch system calls for a more formal approach.

Basic Watch Systems

We break passages into three categories when deciding how to organize watches. First are the overnight trips. On these the watch system will be set up around when we want to be awake for navigational waypoints. Since we can catch up on rest the next day at anchor, we don't worry too much about sleep patterns.

On a passage of two or three days, sleep becomes more important, so the two of us are a little more formal with our watches. Over the years we've experimented with several different systems. We started with four hours on and four hours off, but found that night watches become too long this way. What we like best is a three-hour cycle. On the odd occasion when an autopilot malfunction has forced us to hand-steer, we've used a two-hour system. That seems to be our limit for standing at the wheel.

Three-Hour System

Typically, Linda takes the first watch, from 1800 to 2100. I'll probably be awake for awhile so we can have dinner together. I take the boat from 2100 until midnight. Linda then has the con until 0300. This is her favorite time; all is quiet, the stars are out, and she has the world to herself. At 0300 I struggle out of my bunk and gradually awaken until at sunrise I'm ready to enjoy the dawning of a new day before heading back into the sack. During the daylight hours our watches are usually informal.

On long passages where we're at sea for a week or more, we'll vary the routine at night after the first three or four days. If one of us is feeling especially strong he or she will let the other sleep, perhaps for five or six hours.

On occasion we invite a friend along to help with the watchkeeping chores. In these instances, we modify our time to a two-hour on, four-hour off system. This doesn't always result in extra rest for us, since we frequently find ourselves getting up to check on the new crewmember.

Kids Can Help Too

Even small children can help, especially during the day. When Elyse and Sarah reached the ages of six and nine we felt that they could keep watch for an hour or so at a time, if both of us wanted a nap. Of course they had instructions to call us if they spotted another vessel or noticed anything unusual. They were attached to the boat by a safety harness any time they were in the cockpit. Under no circumstances did they go outside the cockpit. They stood watches only under ideal conditions: mild weather, far from land/or shipping lanes, with both girls up to keep an eye on one another.

At Night

In the final analysis your approach to shorthanded watchkeeping comes down to how you evaluate the evening hours. Most of the time we enjoy the long night watches, which give us a chance to think without a lot of extraneous stimuli to interrupt us.

Air-popped popcorn with just a tad of sprayed canola oil and salt makes for a low-calorie snack to help pass the time on night watch.

Many a pleasant hour has been spent simply watching the sea and the sky, feeling the motion of the boat, and listening for porpoises.

On the other hand, I can remember a few late evenings I thought would never end! Yet even on these seemingly endless nights we have the consolation of knowing that our cruising plans do not depend on outside crew. It is a nice sense of freedom.

Staying Awake

One of the most difficult aspects of shorthanded cruising is staying alert on long evening watches. This is especially true if you're on watch by yourself. With nobody to keep you company as the sonorous throb of a diesel or the rush of the bow wave dulls your senses, it can take a substantial effort to stay awake.

If you're far offshore, out of the shipping lanes, and well away from any navigational hazards, you can afford to relax a bit. But most of us cruise closer to land and a sharp lookout is a necessity.

The key for me is to keep myself occupied during the watch. Mental stimulation coupled with occasional physical activity helps keep the neurons snapping.

There are many types of timers to use on watch. We find it best to use one with a really loud, obnoxious bell. That way we're sure to respond when it goes off.

I find it difficult to get myself going after a deep sleep. There's something about a warm bunk that my psyche just doesn't want to give up. So I always start my watch with a turn around the deck to feel the wind and sea, to have a look at how we're sailing, or to listen to the engine and running gear. The fresh air on deck helps get me in tune with what's happening aboard and gets rid of some of the cobwebs.

After that I bring myself up-to-date on the navigational situation. I make sure that the latest fix has been plotted on the chart. Then a read through the ship's log is in order. If there are any special things to watch for—perhaps keeping an eye on the engine's oil pressure, or checking for navigational waypoints—I'll make a note to myself.

If we're sailing, I check sail trim every half hour or so. Under power I like to have a look in the engine room at least once an hour to make sure everything is copacetic. A check of bilge sumps is made on an hourly basis as well.

Help

Snacks

After all this activity I gravitate towards the galley. Linda always makes sure to stock up on munchies for the night watches. However, as the years have rolled on and our respective metabolisms have slowed down, we've become more limited in what we can handle in the way of calories.

Popcorn is now the staple in our on-watch diet. It has a high ratio of oral gratification to caloric content, although I must confess to giving in on occasion to the urge for more substantial fare, such as peanut butter and crackers.

Non-alcoholic drinks help pass the time too. We've found that leaving out a vacuum thermos full of hot water lets the person on watch choose his own hot beverage, without having to light up the stove. We try to avoid drinks with caffeine, as they make it difficult to get back to sleep after the watch is over.

A walk around the deck after you've just gotten up is a good way to familiarize yourself with current conditions and to get the blood moving—especially if it is cold out. And you can put on a fashion show for the dolphins and flying fish, too.

Entertainment

If a strict watch isn't necessary you may want some form of diversion to help keep yourself alert. The type of entertainment activities available will be dictated somewhat by the limitations of your interior layout. The off watch has to have a quiet, reasonably dark environment in which to rest. This means that on most boats listening to the radio or stereo has to be done via headphones.

I enjoy listening to the variety of radio programs available on short- and medium-wave bands. In the evenings it's frequently possible to pick up medium-wave AM broadcasts at long distances; these offer an enlightening look into other regions of the world. A good shortwave receiver will provide many hours of interesting entertainment. BBC and VOA broadcast around the clock on numerous frequencies, as do some of the overseas radio services of nations not so friendly to our view of the world. In a couple of hours of listening you can hear amazingly divergent views of the day's events!

In order to read for pleasure you'll need a focused night light, preferably red in color. This will minimize light disturbance for the off watch and reduce your loss of night vision. If you're going to need your night vision, however, avoid any form of reading or exposure to light sources.

Getting Back to Sleep

Having tried all sorts of tricks to stay awake for your watch, you may think immediate sleep will be your reward, but this is not always the case. Your natural body rhythm may be such that it's difficult to drop off right away. We find that it helps to change out of watch clothes and into some-

Help

After the first hour of a watch I like to bring the ship's log up to date and replot our position on the chart.We take the GPS position and check it against some other position (radar, DR, visual bearings).

At the end of the watch, the person coming off duty tops off the thermos with hot water and lays in a new stock of goodies for the next crewmember. The newly awakened watchkeeper will greatly appreciate a steaming cup of bouillon, hot chocolate, or coffee.

(Below) Linda snuggles in for a cold night watch aboard Sundeer. We're en route up the Pacific Coast towards Puget Sound and Canada.

thing more comfortable. A quick shower, or at least a wash, also helps you to relax. Good air flow in your sleeping area is essential, either from a hatch, dorade vent, or small fan. If you're using leecloths, try having them made from webbing so air flow isn't blocked.

When trying to sleep during the day we wear a pair of eyeshades to keep out the sunlight. Eyeshades are also a help where cabin lights may occasionally disturb you.

Then there's Linda's warm milk recipe, guaranteed to generate a large dose of Z's quickly.

Sleepy-Time Milk

Ingredients: 1 cup milk, 1 teaspoon honey, 1/4 teaspoon vanilla extract (or more to taste), dash of cinnamon or nutmeg.

Procedure: Heat the milk until it is very warm, but not hot. Stir in the honey and vanilla, sprinkle with cinnamon or nutmeg, pour into a mug, and enjoy!

This makes an excellent natural sleeping potion.

Radar For Watchkeeping?

Radar is a definite aid to watchkeeping, but it cannot replace the human eye. In smooth water and clear conditions (when you can also see easily on deck) radar works great.

But when conditions deteriorate with a running sea or rain showers, radar can generate a false sense of security. What you think is a clear screen may actually be a radar set blinded by the sea and rain clutter. Many times we've spotted targets by the naked eye which were invisible on the radar.

So while radar can definitely assist the watchkeeper, you still need to take that periodic look around the horizon.

Radar Alarms

Using an alarm for watchkeeping takes a little experimentation. We've found that if the alarm area is set too close to the boat, even a large sea will set it off. So we use a range from four to 24 miles away. This eliminates false alarms from sea clutter close in and gives us the maximum distance in which to pick up a target.

Help

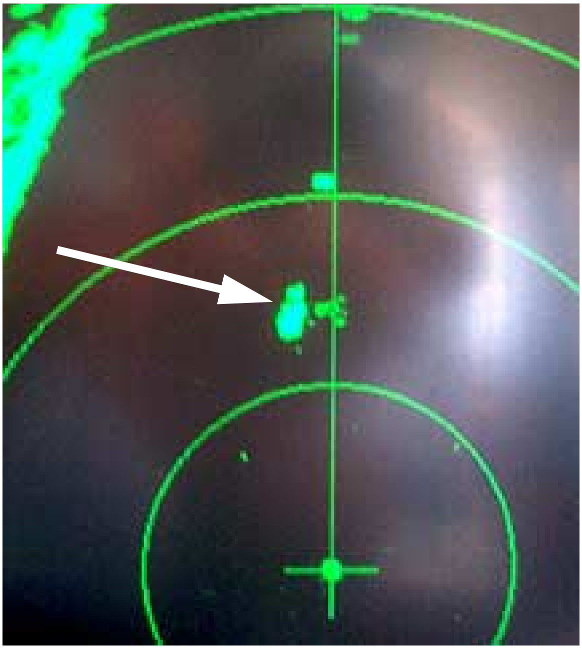
Offshore, well outside of the shipping lanes, we find that leaving the alarm at a maximum range has a number of benefits. First, it alerts us to shipping long before running lights are visible on the horizon. We can then track their course on the radar and see if we are converging. Second, it creates many opportunities to break the monotony of a long watch with a VHF call to our opposite member on the bridge of the other vessel (that you otherwise would not have known was there).

The subject of radar is covered in detail in *Offshore Cruising Encyclopedia* starting on page 193.

We've found that closer to land, and in areas of heavier traffic, it's necessary to reduce the alarm range, sometimes down to just a few miles. If sea conditions are smooth we crank it right into the minimum setting.

There are also selective sector capabilities. If we're expecting to find land under our lee, we set the alarm area on the beam. At other times we set just the forward sector to let us know if land is coming up over the horizon in front of us.

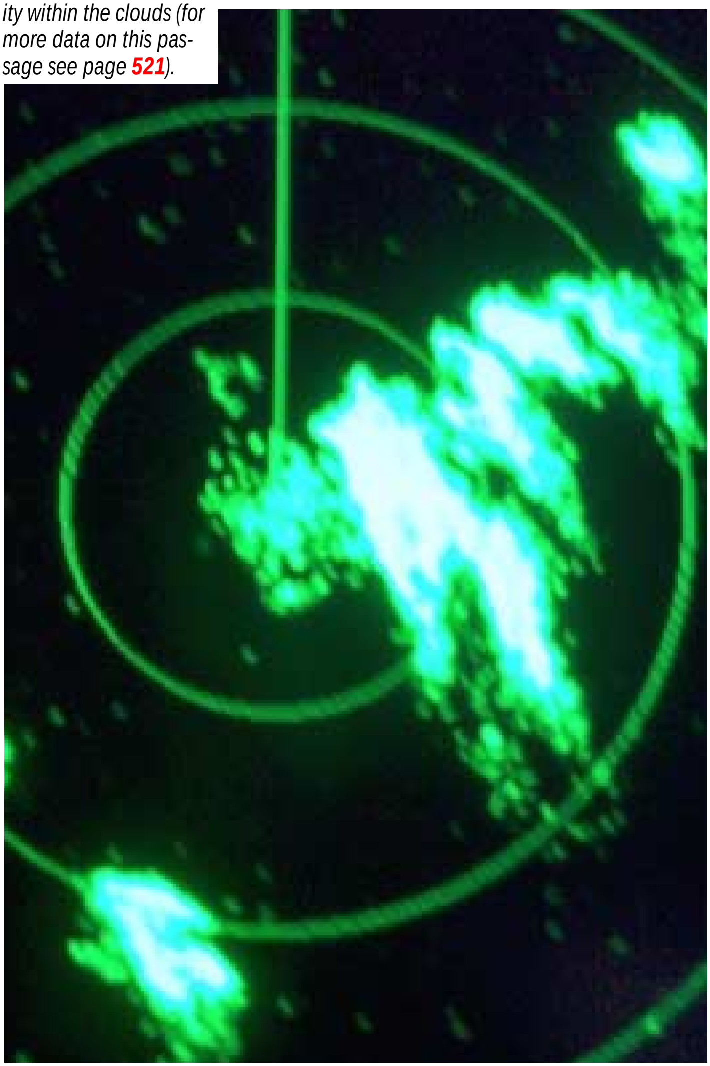
Because of the variety of sea clutter that will be experienced, as well as differing atmospheric conditions, it's important to be able to control both the radar's range as well as the thickness of the radar band. Some of the sets on the market with built-in guard zones don't have alarm zone width control. This is a serious shortcoming.



The radar image above is in clear air (no rain) and smooth seas. Electronic target enhancement is turned on. The large target (white arrow) could be a rain squall, or another vessel. Now take a look below. This is reality. A huge Japanese car carrier leaving Hamilton, Bermuda. Always confirm radar targets visually! The smaller targets above the arrow are channel markers.

Help

*Radar is excellent for long range weather alerts—showing you the rain band/or squall line which often precedes a frontal passage. It also works for threading your way through squall lines as shown below. This photo was taken as we crossed the North Wall of the Gulf Stream concurrent with a small front moving offshore. The radar helped us pick the best spot to head for to avoid the lightning activity within the clouds (for more data on this passage see page **521**).*



Weather Alert

Radar alarms also serve as a weather alert. No longer can rain squalls creep up unannounced. The minute the rain band of a squall of even moderate intensity hits the 24-mile zone, the alarm rings. This allows us to take evasive action, shorten sail, or, if we're lacking wind, head in the direction of the squall.

Gain Settings

We've found that there is a delicate trade-off on the alarm settings. Maximum sensitivity on the radar receiver, combined with the maximum protected target area, means even a small shower or large wave will set off the buzzer. This leads to a lot of false alarms. On the other hand, reducing the radar gain and opening up the target area somewhat means that only commercial vessels and larger squalls will be brought to our immediate attention.

Catnapping

Over the years Linda and I have gotten into the habit, when outside shipping lanes and well away from land, of catnapping for 15 minutes at a time when on watch, with a kitchen timer to wake us up. Even although we know that 15 minutes isn't enough time for a ship to converge with us, we are always a little uneasy at leaving the deck unattended.

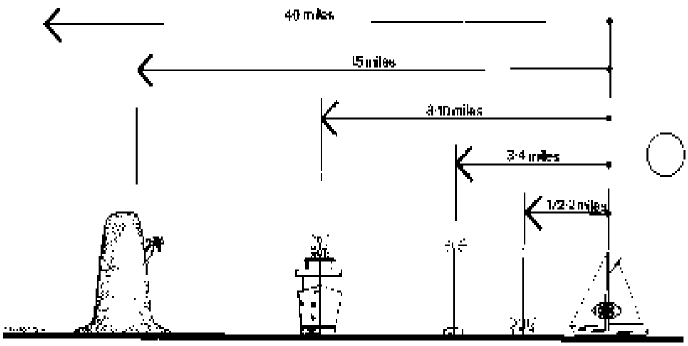
While we still maintain our catnapping schedule, the proximity alarm allows us to relax a bit more.

Security Issues

We came up with another use for our radar alarm a few years ago when passing through the Bahamas. We'd been warned by US Customs to be careful of isolated anchorages, which are

Help

often settings for criminal activities. However, the thought of clear water and sandy beaches, combined with fatigue, made a couple of stops too alluring to resist.



So, just in case, we left the radar set running while anchored, with the alarm set at minimum range and the gain turned up to maximum. With this setting, even a small vessel at a range of a mile should set off the proximity alarm.

How far can you see with radar? A long way, with a powerful set. The key is not antenna height, but the height and shape of the object sending the return. With our 48-mile Furuno we pick up atolls at 30 miles, high islands at 60 miles, and weather at 50 to75 miles (the longer ranges are achieved with an offset screen).

Staying Alert

Intermezzo's clock sounds seven bells. Eleven-thirty, I think to myself. Another half-hour and the sun will pass overhead. A large wave lifts our stern, and *Intermezzo* begins her graceful descent into the trough below.

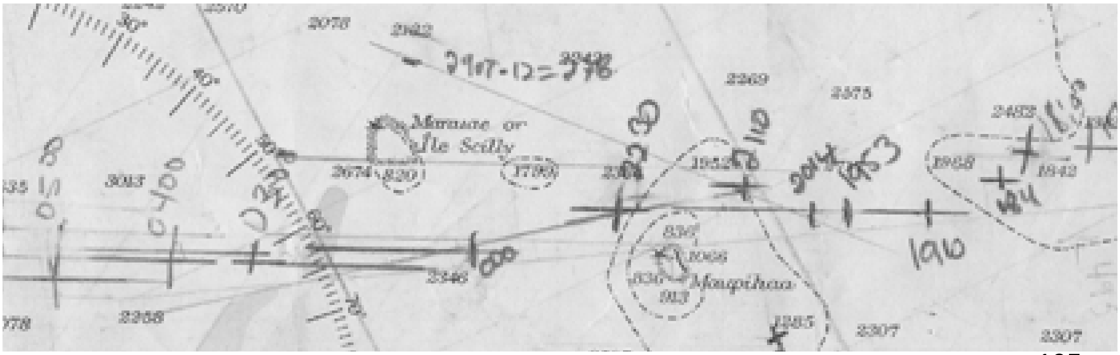
Surfing down these substantial South Pacific seas has become commonplace the last three-and-a-half days. It has been blowing like stink from the southeast, and we have covered nearly 200 miles a day since departing Bora Bora.

Suvorov

Suvorov Atoll lies ahead, if only we can find it. Without a reliable celestial observation since our departure, I have been working strictly with OMEGA. This, plus our dead-reckoning track, puts us within 30 miles of the reef.

Once the sun moves overhead, into our eyes, the transparency of the water will deteriorate and we will be forced to alter course to make sure we miss the inviting lagoon and its dangerous reefs. Suvorov is one of those spots cruisers dream about. A single narrow entrance gives way to an enormous mid-ocean lagoon, more than 20 miles across, within which there is a small, semi-protected anchorage. With only a few acres of dry land Suvorov has been the off-and-on home of hermit Tom Neale.

In the days before satnav and GPS we would normally take three sun sights and a couple of rounds of stars on each day of a passage—weather permitting. The problem with the trip to Suvorov is that the sky filled in a few hours after we'd left Bora Bora. So we were stuck with an occasional OMEGA line of position, and our DR track as shown below.



Help

This is from the "official" chart of Suvorov island. Not much detail! And it is out of position by a couple of miles. But then, you're supposed to find this sort of spot by looking for it.

Of late it has become a stop for South Pacific cruisers en route to the Samoas and Fiji. Tom's hospitality, abundant lobster on the outer reef, and a wrecked Taiwanese fishing vessel with full diesel tanks await.

Braced against the dodger, I lift my binoculars as we rise to a sea. Just ahead and to port I can see a faint change in color on the underside of the clouds. Trying to steady the glasses with one hand and brace myself with the other, I scan the horizon. If there is color it must be the reflection of the lagoon.

Linda is on deck now too.

"Over there," she points. "Just to port of the pulpit. Aren't those trees?"

"They sure are," I yell with delight. "We found it! It won't be long now. Go below and flip on the radar, please. I want to check our distance off the islet with the trees."

Linda drops down the companionway to warm up the radar while I continue to take stock of the situation. Secure in knowledge of our location, I begin to relax. Traveling on to Samoa, some 900 miles, without a positive position fix wasn't at the top of my list of ideas for having fun. I would much prefer having a calm night's rest between clean sheets in a stationary bunk.

We were very fortunate to learn this lesson—always keep someone on deck when near dangerous landfalls—without it costing us our boat. Many others have not been so lucky.

Even today, with GPS so common, boats are still lost on reefs because of navigational errors. There is simply no substitute for having a sharp pair of eyes on deck whenever a mistake by the navigator could cause a serious problem.

The trees continue to grow in detail as we surge forward, and the radar whirs overhead. I anxiously await word from Linda on our distance off. We are on starboard tack, running square, and I figure we will have to jibe. But I don't want to head down too soon and have to jibe back.

"I can't get the set tuned in!" comes Linda's reply to my inquiry. "You better come down and adjust it."

Nature Calls

"Just a minute. Nature is calling."

I step to the leeward shrouds of the mizzen, fumbling with the layers of my foul-weather gear. Our stern raises to a particularly large sea, and as it starts to roll under, *Intermezzo* heels momentarily to windward. There, just under the main boom and directly in front of us, a quarter-mile off, is a large white ribbon of breaking reef.

Instead of being north of Suvorov with a clear run down to the pass and islet, we are south and have six miles of reef under our lee.

Had I taken the two minutes necessary to drop below, adjust the radar, and read our distance off the islet we would have been thrown ashore on the fringing reef—a precipitous, and premature, end to our cruising plans.

Keep a Close Watch Near Land

Having a watch on deck whenever land/or other dangers are near is a fundamental tenet of defensive seamanship. Of the few yachts that get

Help

themselves into difficulty cruising, a majority do so because they have not been keeping adequate watch.

During our final approach to Suvorov, had I not taken that last moment on deck, disaster would have been the result. Going below to check the radar under such conditions now means the off-watch comes on deck to keep an eye on things.

But just being on deck doesn't in and of itself protect you. The watch must be alert to potential dangers. When making strange landfalls or traveling in areas where navigation aids, charts, or pilots are suspect, the watch must concentrate.

Malakula Island

Move with us now to the eastern shore of Malakula Island in the New Hebrides. It is a beautiful, sunny day as *Intermezzo* motorsails through a calm sea. We are heading for a rendezvous with cruising friends at Santo Harbor on Espiritu Santo Island.

We are 4 1/2 miles off the island, enough distance to give a wide berth to charted shoals six miles ahead. From radar, visual observations, and dead reckoning, we know our *exact* location. The sun is behind my right shoulder, and I have excellent visibility.

Sitting comfortably at the entrance to *Intermezzo*'s companionway, I look up from my reading now and then to check our progress and scan the horizon. At 6.5-knots, I think to myself, we'll be able to anchor in time to get the awning set and take a swim before dark. With that thought I drop back to the world of the occult and am re-absorbed in Carlos Castaneda's latest book about the sorcerer Don Juan.

Shallow Water

I am startled out of my concentration. For a second I am confused, and then I realize what it is. The water has changed color. From the safety of dark blue, it has turned to pale green. Standing up, I can see coral beneath our keel. The water is rapidly shoaling.

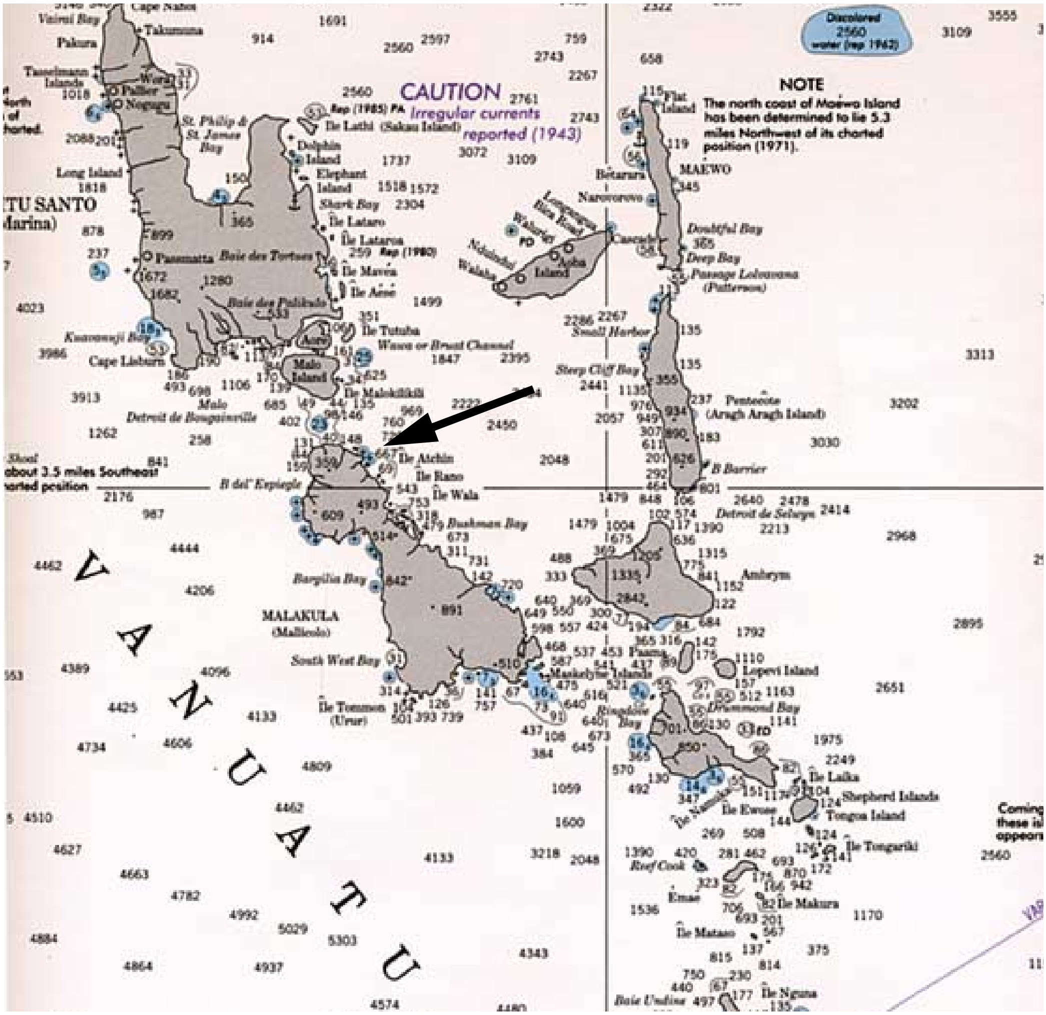
I grab the autopilot control and hit hard starboard, but it is too late. Already we are in stag coral and *Intermezzo* scrapes along the tops of the branches.

Linda is on deck now. The first scrape has brought her running.

"Grab the wheel!" I yell. "Head her southeast."

I climb quickly to the lower spreaders to look for a way out. All around us is stag coral. Many patches must be in water shallower than the 7-feet (2.1-meters) our keel draws. If we lose way, or slow down at all, *Intermezzo* will be trapped. Our Martec folding prop will never have enough power to get us moving again.

"Give her full throttle, Linda. It's our only chance."



Intermezzo's little Isuzu diesel surges ahead, trying to increase our speed. We heel slightly as the apparent wind builds.

Above is a chart of the New Hebrides Islands, now the nation of Vanuatu. We'll be telling you a number of sea stories dealing with this area, so you may want to refer back to it from time to time.

The large upper island is Espiritu Santo. The middle (west) island is Malakula, while at the bottom is Efate Island, where the capital is located.

"Starboard 30-degrees. Now port 10. Hang on—we're going to hit!" With a sickening jarring shudder, our keel crushes the shallowest coral. We are through the first patch.

I wrap my left hand around the handhold tapped securely into the aluminum mainmast. My right hand grasps the intermediate shroud.

I bend my legs to absorb the shock I know is coming. "Hard to port!" Our bow swings quickly off and then breaks through a spot slightly deeper than the rest.

Three more times our way is blocked, and we are forced to punch through. After what seems like hours, but in reality is less than a minute, I see the water drop down through the blues. We are free!

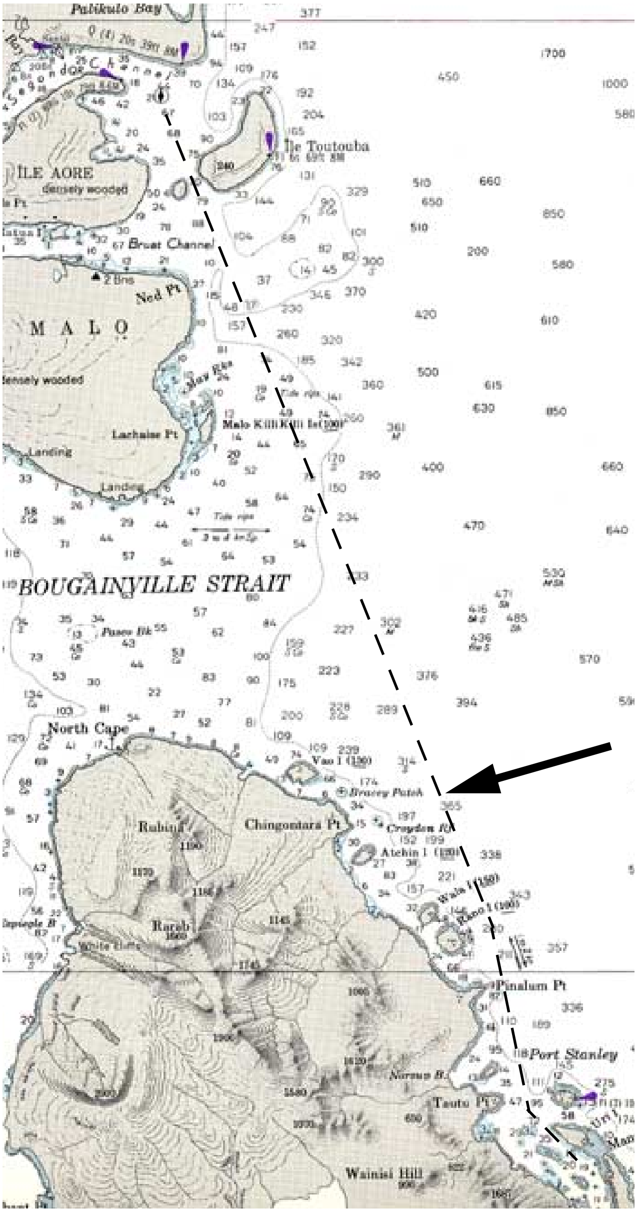
Help

Both of us are shaking now as we rush to assess the damage. Linda checks the sump for water while I inspect the rig. Unbelievably we are watertight, and the rig seems completely intact. I put Don Juan's conversations away for awhile and resolve to truly keep my eyes "on the road" when we are close to land.

The next day in Santo I mention the "new reef" to the harbormaster. "Oh yes," he replies, "that area tilted up about 30 feet (9 meters) in the earthquake last year." So much for relying on printed aids to navigation.

Most people learn their lessons the hard way. We are no exception. Generally speaking, the more experienced a sailor is, the less he will rely totally on any electronic or printed aids. His eyes, ears, nose, and a sense of motion are the ultimate arbiter of safe passage.

Obviously you cannot maintain an absolutely alert watch every minute of every passage. But when land/or other obstructions are close, your vigil should never be relaxed.



The chart above looks nice and clear where we ran into the shallow patch. Another lesson—never depend on printed aids to navigation. A close watch will do better to keep you out of trouble.

Environmental Protection

Any time you are close to land (or open ocean reefs) a close watch needs to be kept. This may mean long periods on deck. In the tropics a good sailing awning or bimini is a necessity. In higher latitudes, shelter to keep you warm becomes increasingly important.

Having the right foul weather gear, when required, is also a prerequisite. If the crew is comfortable on deck, a better, more alert watch will be kept.

Help

Linda (above) keeping a close watch as we passage from Rabaul to Madang in Papua New Guinea. By this point in our circumnavigation we had learned to always have someone on deck in coral-strewn waters.

Left, one of the new-age hazards cruisers have to contend with—an unmanned weather recon buoy. NOAA has several dozen of these floating around the world. They show up well on radar as long as there isn't a big sea running. However, in sea clutter you will only see them by having someone on deck.

Toga Coar

Help

Flotsam

There are some parts of the world where floating hazards are a way of life. Trees, logs, cargo, and other hull-banging items are common.

If you are cruising in areas with lots of logging going on, or where large rivers empty into the sea, you will need to be alert all of the time. Heavy rains and/or flooding usually bring with them lots of flotsam and call for an extra level of alertness.

The risk from collision depends upon construction (and if you have watertight bulkheads), how the propeller is situated, and rudder reinforcement.

Props which are protected by a keel (typical in most sailboats) are rarely going to be hit. The norm is for the hull to deflect the flotsam away.

The biggest problem comes with what are known as deadheads. These are logs or tree trunks which float partially submerged. Sometimes just a tip shows, but underwater may be thousands of pounds of obstruction.

Logs like this are a nuisance, but rarely cause problems because they are easily seen. And if you do hit one, it will typically slide down the hull side. Bigger problems come from the logs that are almost totally submerged.

This photo was taken in British Columbia, Canada. That's Elyse on the foredeck shooting video.

Precautions

There are several precautions you can take when you are in areas with known concentrations of debris. First, avoid traveling at night. Next, try to plan your trips so that the sun is behind you or at least no worse than overhead. If the sun is low and ahead, there will be substantially reduced visibility.

Slowing down gives you more time to peruse the waters ahead, and reduces impact damage if you do collide. Impact loads are a function of the square of your boat speed, so the damage done at seven knots will be twice that of a collision at five knots.

Finally, keep close to the throttle/shift lever. If this is not convenient (perhaps the shift lever is in the cockpit and you are under a dodger forward) rig a remote control (usually accomplished with a line, block, and wooden handle).

Warning Signs

Anytime you find sea birds standing on the water it means one of two things: very shallow water or flotsam.

Compare the visibility of this log to that on the preceding page. Without the birds as a warning marker, it would be difficult indeed to spot. Note the left edge (white arrow) which is partially submerged. Debris like this is why you never run at night near logging operations on shore or big rivers emptying into the sea.

In tidal areas and/or areas with strong currents, it is not at all unusual to see dense areas of debris herded together by the current, and then clear areas just a little distance away. This is particularly true in confined waterways.

However, you can also find similar areas in the open ocean where currents converge.

Containers

We have seen all manner of flotsam over the years—everything from huge trees with root balls sticking 30 feet (9 meters) into the air to oil drums. The one thing we have never seen is a shipping container, yet this is one of the few things about which we are truly concerned when passaging.

The figures are not at all reassuring. There are hundreds of containers lost overboard or jettisoned by ships in trouble every year. Most sink, but empty or foam-insulated refrigeration containers stay at the surface.

A number of yachts have sunk after colliding with these hazards.

Because shipping containers generally float just awash, they are particularly difficult to see. So what can you do?

Ideally, you will have a collision bulkhead. Also, your life raft and abandon-ship bag must be ready to go in an instant.

At Night

Being able to see on a dark night is a combination of learned skill and proper environment. As we've already mentioned, the first criterion is that your eyes be kept in the dark. Exposure to light closes down the pupils in much the same manner as the lens of a camera closes down in sunshine. After even a brief exposure to light, you lose accurate night vision for 15 to 30 minutes.

Night Lights

In order to minimize the possibility of accidental "blinding" aboard our boats we install a set of red-coated bulbs, smaller than our usual lights, throughout belowdecks each time we head to sea, or have a secondary small bulb with its own switch in each light fixture. The red color reduces the impact of light on night vision, although it still degrades your vision to a degree.

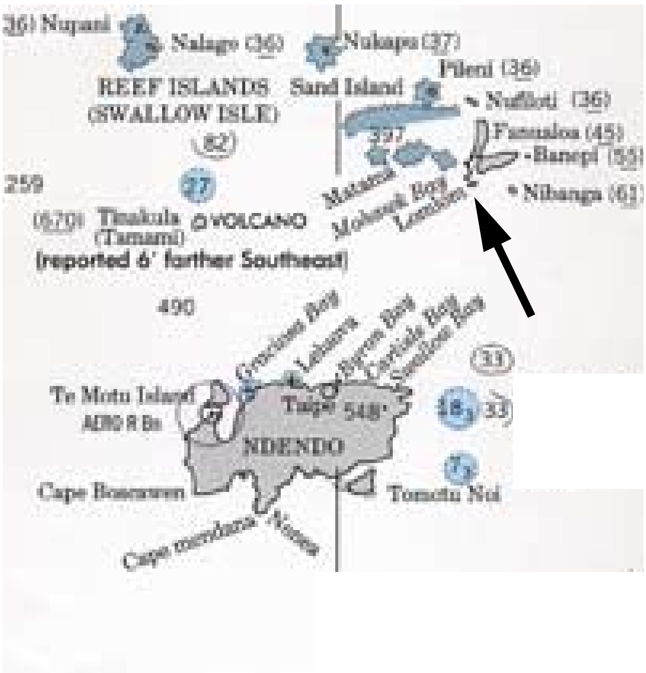
Bona

Move with us now to the southern end of the Solomon Islands. Lying on the afterdeck of the Solomon Island coaster *Bona*, I am trying to grab a few winks. The deepset throb of propeller and diesel vibrate their way into my body. Tired, frustrated at sleep that won't come, I am nonetheless pleased to be aboard.

Linda and I have just had the special experience of visiting the Outlier Islands of the southern Solomons. Because these primitive outposts of Polynesia are encircled by fringing reef, without benefit of harbor or protected anchorage, we are perhaps the first modern-day cruisers ever to visit them. Captain Lanello and his ship have made it possible. On their annual inspection with health officials, police, and insect-control officers, they have been generous enough to offer us a ride.

The Reef Islands lie at the very bottom of the Solomon Islands group in the Western South Pacific. They are a wonderfully primitive and isolated area, with friendly people who were as interested in us and our way of life as we were in them and their approach to living.

With the excitement of the day behind us, I am now a bit concerned about *Intermezzo*. It is the first time we have left her unattended overnight. And while friends ashore (who are also caring for Elyse and Sarah) have said they will keep an eye out, they are landsmen. Even knowing *Intermezzo*'s two big hooks are well set in sand, I still worry.



Unable to rest, I go forward to the wheelhouse. It is the blackest of nights. A strong southeast tradewind is blowing astern, and low clouds scud by, reflected in the starlight. The moon has already set.

The captain and first mate are having a lively discussion as I enter. "That be the north end of the big island," says the mate, shaking his finger for emphasis.

The Bona is typical of the government and trading vessels in this part of the world. Rugged, (she's built of steel) with covered deck space for transporting goods and people, she has been plying these waters for years.

Note the spotlight (black arrow) on top of the bridge. This did an amazing job of illuminating the edges of the reef at night.

"No she don't," replies the captain. "It is the reef to the east." I peer out the window but am unable to see anything. Even although the lighting on the afterdeck is subdued, my night vision is not yet up to the task. I know from experience it will take at least 15 minutes before I can begin to see in the dark.

Peripheral Vision

Slowly my eyes begin to pick out the horizon. By looking out of the corners of my eyes, rather than directly ahead, I can see the white line of surf off the starboard bow. Captain Lanello is right. It is reef rather than island. From his bridge, 15 feet (4.7 meters) above sea level, he has seen the reef on this moonless night at better than 4 miles. I pick it out at 2.

A few minutes later we can see the briefest outline of palm trees to the north. That will be the island, at a range of 4 to 6 miles easily visible even to an amateur like me.

We alter course now, heading for the channel between reefs that will take us to Lomlom Island and *Intermezzo*. Having seen in daylight the narrow, irregular course that we must follow, I am glad we have a heavily built steel hull under us. To our island captain and crew, this is no more than a routine passage. Without radar or other navigation aids, in clear weather and foul, they regularly navigate at night in these waters, with only an occasional scratch.

Atmospheric Conditions

Atmospheric conditions also have a great effect on night-time visibility. Clear, dry air is best. Moisture-laden air, or pollution from dust or smoke will reduce the range of visibility.

Help

As we approach the narrow channel, our skipper climbs atop the wheelhouse for a better look. I walk outside towards the bow. From time to time he shouts a command to the helmsman. Over my shoulder I notice a dark blotch on the horizon. Suddenly I realize that right at the critical juncture we will have to deal with a rain squall. Captain Lanello has seen the clouds as well and calls down for his slicker.

We continue powering towards the opening between reefs. I am distinctly uneasy about the prospect of piloting its narrow confines on a moonless night with rain squalls about. But at the last minute our captain orders engines slowed and allows the squall to overtake us.

In 15 minutes it has passed by, and we continue. I notice that the residual moisture in the air has cut my own range of sight in half.

How Far Can You See?

From time to time we can see the flicker of a fire or pressure lamp on the island behind the eastern reef. When we're just 3 to 4 miles away, they show up well. I know from comparing sightings against what appears on *Intermezzo*'s radar screen that the lights of an oceangoing ship can be seen 8 to 10 miles off in good conditions. A yacht with a masthead tricolor and a 25-watt bulb will show up at 4 miles or more. Conventional running lights at deck level are visible from 1/2 mile to 2 miles. The loom of city lights can sometimes be seen as far away as 40 miles or more, especially when reflecting off a high cloud cover. Lighthouses, too, can often be seen well outside normal range by their loom against the clouds.

Using Binoculars at Night

A good quality, clean pair of binoculars is a great aid to night vision. It helps to pick out distant lights and the silhouette of land against the horizon. In moonlight, a pair of glasses can help you see almost as well as in the daytime.

However, some binoculars that work well in daylight don't have good light-gathering qualities. To be sure you are getting a pair that works well in both situations, try them out at night, preferably in an area with low light levels.

Spotlights

The reef on our port side is steep-to, and we make for it rather than try to ride the center of the channel. One-quarter mile off, our course is adjusted to parallel, and the skipper turns on his powerful spotlight.

I am amazed to see the edge of the reef outlined clearly, a brown line with occasional lighter blotches, meandering along our side. The spotlight situated on a small mast over the captain's head has very little glare, and we still have some night vision on either side of it.

The use of spotlights at night is common with commercial vessels.

In moonlight, especially if the moon is behind you or opposite the direction you are looking, your range of visibility will be greatly extended. High land can then be seen at 15 or more miles in clear air.

Even with overcast, 4- to 6-mile visibility is possible. If the moon is ahead of you, although, trying to see is like looking into the sun. The "glare" of the moonlight tends to mask targets until you are much closer.

Night vision check list:

- ❏ Allow 15 to 20 minutes for your eyes to adjust to night light levels.
- ❏ Avoid looking at any onboard lights.
- ❏ Have someone else do the navigating.
- ❏ Turn down lighting on all electronics, especially radar.
- ❏ Scan with your eyes back and forth. Don't fixate on one point.
- ❏ Look for objects at the edges of your vision rather than the center.

One more rain squall and *Bona* was anchored off *Intermezzo's* stern. We were extremely relieved to find her happily afloat, none the worse for our short trip away.

They are used not only in clear water with steep-to reefs but also in the higher latitudes for spotting logs, rocks, and tide rips. Specialized models are available with anti-glare lenses.

There are two important factors to remember when using a spotlight. First, the higher it is, the better the viewing angle and the less the glare. Second, any rigging that it passes over will reflect the light, destroying night vision and reducing the viewing range of the spotlight itself. Situating a crewmember with the spotlight in the rigging will help the height, but it can cause a problem with reflection unless he or she is very careful with how the light is aimed.

On some boats a servo-motor-operated spotlight mounted at the masthead can solve most of the problems with glare and reflection. You can find powerful models that, with the exception of their electrical wires, are relatively light in weight.

A good-quality light will show up objects at a distance, still leaving you with some night vision for the darker areas.

Night Scopes

On a theoretical basis I've always put "night scopes" into the toy category. They seemed to be expensive, fragile, and of limited use on a pitching deck due to their weight. However, the technology has taken a big leap forward and prices have dropped, while they've gotten lighter and even waterproof to some degree.

Being able to see at night is an acquired skill. By practicing both with and without aids, you learn to interpret outlines and shadows. As experience and confidence builds, more and more becomes visible in what would otherwise have been unusable light. Close to home, where the terrain is familiar and dangers are known, is where you should learn and practice. Having confidence in your skills can sometimes mean the difference between safety and disaster.

Which brings us to the Society Islands in the Southern Hemisphere winter of 1995. Friends on Raeitea have a pair of the ITT night vision binoculars aboard, and when I give them a try I am startled by the ease of use and clarity of the images.

There are some folks walking down a dock about 75 yards (72 meters) from where we are moored and on a totally dark night you can see them very clearly. Looking aloft at our masthead the halyards are clearly visible—a great tool if things get a bit tangled on night watch.

Night scopes are available in a variety of configurations, different amplification levels, and three different tehnological styles (Types I, II, and III). Surplus Russian models can be obtained quite cheaply, but how well they'll stand up to the marine environment is open to question.

The ITT scopes are truly watertight, quite light in weight, and as we've already mentioned, extremely clear.

Before taking off on our last cruise aboard *Beowulf* we acquired a pair of Type II night glasses, and they do come in handy at times—although we would never put ourselves in a position where our safety was at risk if they didn't work right. The one drawback? There is no sense of distance, as you have with regular binoculars. Therefore, a good set of conventional glasses are still at the top of the list.

Bali, Indonesia (left) has thousands of these small fishing outriggers. These are often out at night without lights, and do not have a good radar return.

FISHING TRAFFIC

In some parts of the world commercial fishing is a hazard to navigation that requires close attention. The odds are that most vessels, at least those with smaller crews, will be working their catch with nobody on lookout and the boat on autopilot. On the other hand, if they are not working it would not be surprising to find the crew asleep, again with no one on watch.

On our trip through the South Pacific in 1996 between Niue and Tonga we saw a large radar target which was dark, and still in the water. This turned out to be a Taiwanese fishing vessel, about 120 feet (38 meters) long, which was hove to without a single light showing.

It is your job to see them first, and then stay out of the way.

Dealing with lobster pots and fish traps:

- ❑ Pass on the downcurrent or leeward side when possible (to avoid the slope of the line between float and trap).
- ❑ When sailing you can still catch these on the keel, edges of the prop, or rudder—so pass to leeward where possible.
- ❑ If it looks like you are going to run down a float, take the engine out of gear.

Inshore

Generally speaking, inshore fishing activity involves smaller vessels and short net sets or bottom dragging operations. Nets may or may not be buoyed. If going astern of a working fishing boat, give it a wide berth. Better yet, pass ahead to be sure to clear the nets.

Occasionally you will find two fishing vessels dragging a net between themselves (pair trawling). Obviously you do not want to get between these vessels.

Above, a small trawler bringing in its net. These surface nets can be several thousand feet (600 meters) long, so stay out of the way.

Help

When you see two fishing boats in close proximity (although sometimes as far as a quarter mile apart) they may be pair trawling. In this case there will be a net connected between the two boats.

This boat fishing for salmon has a series of long trolling lines strung aft from the outriggers. These can be as far back as 500 feet (150 meters) or more.

An unusual situation off Narragansett Bay, Rhode Island, with fish nets strung between floats made from 55-gallon (210-liter) barrels. Not something to run across at night!

Offshore

Further offshore, fishing vessels are much larger, and the size of the nets increases geometrically. You may find literally miles of nets set just below the surface, with bouys every 300 to 400 feet (100 to 130 meters).

Generally, drift nets are set so far below the surface that they are not a problem. But some vessels set them right at the surface, which can make a hell of a tangle on keel, rudder, and prop.

How do you know if a drift net is in your area? If you see a large fishing vessel, or a factory ship surrounded by smaller fry, keep your eyes open.

Tugs and Tows

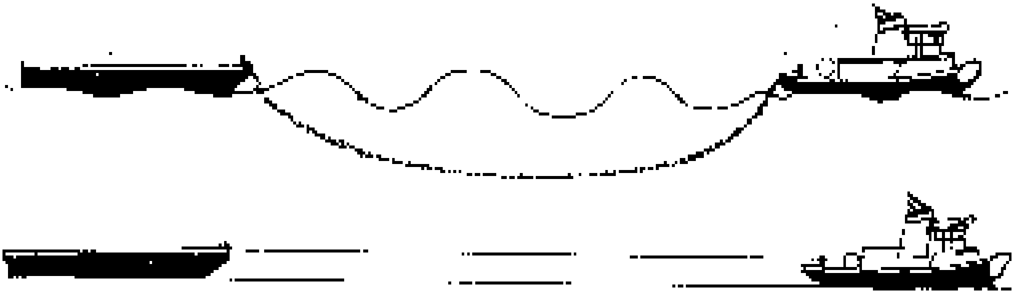
Tugs and their tows are another hazard to watch for in coastal cruising. These sometimes move at relatively fast rates of speed, with a separation of as much as a mile between the tug and the barges behind.

Never attempt to pass between the tug and its tow. The tow cable will at times be well below the surface, and at other times pop up to the surface. If you get caught on the cable as it is coming up, it will slice through the hull like a knife through a loaf of bread, or hang onto the boat until it is hit by the barge!

It is sometimes difficult to make out the tow behind the tug, especially at night or in dirty weather.

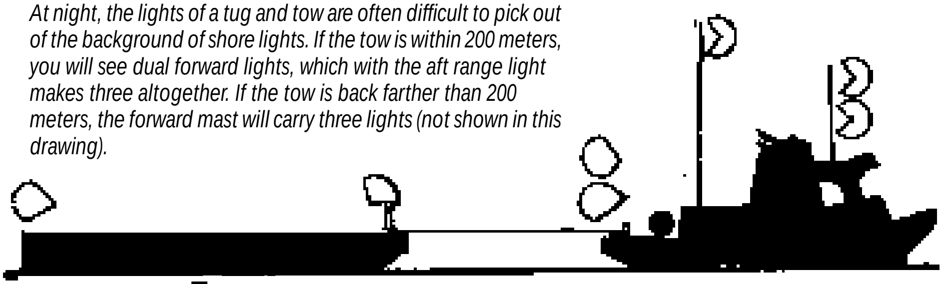
The standard shapes and/or lights which indicate the condition of the tow are in a sketch nearby. It makes sense to look at these periodically so that if you do find yourself in the vicinity of a working tug, you know what to look for.

Tugs and tows on radar: Unless you have a very large antenna, the odds of seeing the tug and tow as separate targets are slim. Most radars, even those with 48-inch (1.2-meter) antennas will merge the two targets. The only way to know is to watch for the towing lights and/or the tow itself. If the target you are watching has land behind it, take care not to dismiss extra lights as something extraneous on shore.



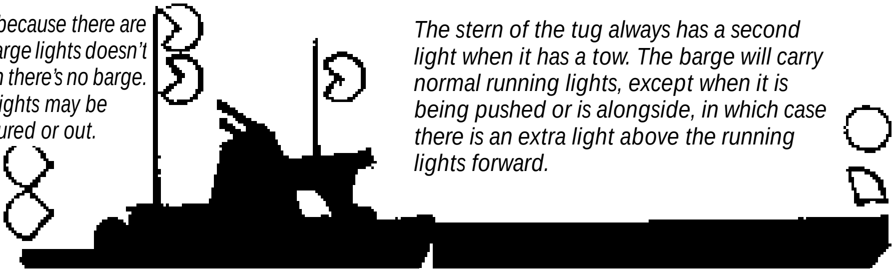
It is often impossible to see the tow line between tug and barge. It may be submerged, or just too thin to see in the existing conditions. The tow line surges up and down as waves load and unload the towed object(s). If you happen to be over the hawser when it tightens, the odds are your boat will be cut in half.

At night, the lights of a tug and tow are often difficult to pick out of the background of shore lights. If the tow is within 200 meters, you will see dual forward lights, which with the aft range light makes three altogether. If the tow is back farther than 200 meters, the forward mast will carry three lights (not shown in this drawing).



Just because there are no barge lights doesn't mean there's no barge. The lights may be obscured or out.

The stern of the tug always has a second light when it has a tow. The barge will carry normal running lights, except when it is being pushed or is alongside, in which case there is an extra light above the running lights forward.



Help

When viewing tugs and tows on radar or by eye how they appear is very much a question of your viewing angle and the distance between the tug and tow. In crowded or tight geographic areas the tows will be close to the tug as shown in these three photos. On radar, these upper two would show as a single blob. If you have a good quality radar with a large, open array antenna the lower photo might show up as two targets.

The Inner Sense

Since we have been on the subject of watch-keeping, perhaps we should talk briefly about a subtler form of staying alert aboard your yacht.

Just as a mother can miraculously detect the faintest cough or cry from her children through closed doors at the far end of the house, so too can those attuned to their yachts detect seagoing messages at an almost subliminal level.

Every yacht speaks to her crew in a variety of ways. If you are alert, with your senses attuned, the subtle messages a boat transmits can save much grief, effort, and expense. Sailing yields one form of music, and machinery another. Indications are also transmitted from the sea.

The key to receiving and understanding these indirect messages is to note carefully when your senses register any changes from the norm. The change may be so slight as to sit just on the edge of consciousness, teasing your awareness. We find occasionally it comes almost as a mental tickle, a frustration we can't quite grasp.

Focus Indirectly

Over the years we have learned to focus our awareness indirectly, to come to grips with stimuli from the flanks. Having learned the hard way, we always try to identify the message before proceeding on some new endeavor.

Sound

At sea, under sail, we knowingly or subconsciously depend upon a symphony of sound to create moods to help us with trim, to tell us when we are overpressed or not moving well. If you want to realize just how important these sounds are, try sailing with ear protectors.

Anyone who has been involved with high-performance machinery will recognize instantly the slightest change in engine hum or vibration.

A difference in the low-decibel sound level or frequency of vibration, while almost undetectable by itself, is easy to sense when it's set against a background of expectation.

The situation is similar at sea when the diesel is running. There are few stimuli competing for your attention, and while you don't need to concentrate on the noise itself, you should have in the back of your mind an awareness of exactly the right "tune" the engine and its accessories should be singing.

There are always diversions on watch: reading, listening to music, talking to other crewmembers. But through it all, whomever is responsible for the boat needs to keep his or her inner ear tuned for these subtle signals of the boat, wind and sea which are always in the background.

These signals often provide an early warning to keep you out of trouble—if you are listening.

A slight change in rpm could signal different engine loading or perhaps a fuel problem. A small difference in vibration patterns can give early warning of propeller, bearing, engine mount, or accessory malfunction. Even a loose V-belt gives out a signal.

Yachting One-of-a-Kind Regatta

We learned the importance of sound in the late 1960s in a *Yachting Magazine* One-of-a-Kind Regatta.We were racing our 32-foot (9.8-meter) D-class catamaran, *Beowulf V*. This was a cutting-edge high-speed machine, backed by a sophisticated performance sailing computer program (very rare in those days).

On board were some of the first digital readout sailing instruments, but we found that if we had to look at the dials, interpret the data, and then react, we lost too much time. With all our computer backup and sophisticated design, we still had to sail *Beowulf V* by the seat of our pants, which we did well enough to be ahead in the regatta by the third race.

Sports Illustrated Magazine asked us if we would mind having a helicopter follow us around the race course to shoot some photos.

"Not at all," we said. "Just don't mess up our wind, and stay out of the rigging."

Beowulf V at speed during the Yachting One-of-a-Kind Regatta. This was one of the photos taken by the helicopter for Sports Illustrated.

Beowulf is hooked up on her apparent wind and smoking along. Note the wind strength and direction. It is blowing about 10 knots true off the stern quarter. Now check the main boom position. We are pulling the wind so far forward the main is just about centered and the reacher is being flown to leeward.

Okay, we're getting a little excited here, but looking at these photos 25 years later gets the juices flowing!

The chopper and photographer found us during the first broad reach of the modified Olympic course. We were sailing with big drifter and main, at an apparent wind angle of 29-degrees, with the true wind on the quarter. In the 10-knot winds *Beowulf V* was doing her normal 20 to 22 knots. Steve was steering from the trapeze, while Norm Riise (our computer expert) and Rick Taylor (resident sailmaker) rode the main beam and controlled the sheets.

We had all raced together off and on for years, and little verbal communication was necessary. With *Beowulf V* generating so much apparent wind, each minor change in true wind velocity or direction necessitated major corrections in helm or sheet. It was like riding a knife edge. A little too much power and over we would go; too little, and the speed would drop in half within seconds.

The noise of the chopper's engine and rotors behind us was overpowering. None of us could hear a thing. We quickly discovered that we totally depended upon sound for input on sail trim and steering angle. The bow wave, the wind, and the fins all had messages for us. Unable to hear, we were unable to sail. That we kept ourselves upright and moving while the chopper was on our tail was a function of luck. Overall our time for the leg was substantially slower than it was in any of the other races of the series.

It was an interesting observation, and we chose in the future not to make it a habit to have helicopters flying in our rigging! But offshore, in larger vessels, with subtler sounds, we have learned to listen carefully, especially when down below.

The ever-present theme of wind on sail and rigging, sea against hull, gurgle of bow and quarter wave, can hide notes of change that can mean something's amiss. On deck, background noise is overpowering. Below, masked by insulation and structure, the sounds we seek to warn us are also muted.

The chattering of a leech or luff of a headsail both send signals. At night we frequently trim by sound alone. In heavy airs, any change from the norm is cause for investigation. In these conditions improperly led or sheeted sails can soon cause damage, but fortunately, they protest their maltreatment loudly and immediately.

Help

Smell

Smell is a potent message-carrier. When you first board a vessel, a potpourri of scents may waft towards the nose. Eventually these odors form a backdrop against which your senses can measure interlopers. A whiff of acrid smoke caught on deck means trouble in the electrical department. Perhaps a circuit breaker is overloaded, and the wiring is beginning to burn. Leaking diesel, oil, propane, gas, or paint stores all can be detected by odor well in advance of explosive levels.

The key is to be sensitive to anything different in the aroma aboard your boat—any new scent that might signal change is in the air.

Structural Sounds

Structural sounds have a different theme. Some vessels creak and groan rhythmically as they are worked by the sea. More modern vessels, especially those of fiberglass, rarely talk unless there is a problem. A loose bulkhead or an overly flexible hull will usually make itself known well in advance of disaster.

In the spars and rigging the type of sound is different. Here it is the sharp retort, perhaps barely a crack above the ever-present background noise. But a snap or crack indicates structural failure that must be dealt with quickly if the rig is to be kept intact.

On the opposite side of the equation, when you are anchored snugly and there's no sea noise, the sound of wind in the rigging becomes omnipresent. Even a gentle breeze sounds overpowerful. Many is the time we have debated the wisdom of heading out when the noise on deck seemed to indicate prudence, only to switch on the anemometer and see it register just 12- or 15-knots.

Then there is the anchor chain on the bottom. Listening to it tug at the bow or rattle over the seabed gives warning of shifting position or dragging.

Motion Signals

Motion sends another type of message. Below, in the relatively quiet confines of the cabin, you may feel changes in motion that are the first indication of your vessel's need. Perhaps her gentle gamboling becomes a higher stepping pitch, gradually building until it is impossible to ignore. If you pay attention early, you may be able to change sails or head off on a new course that will be difficult to effect later.

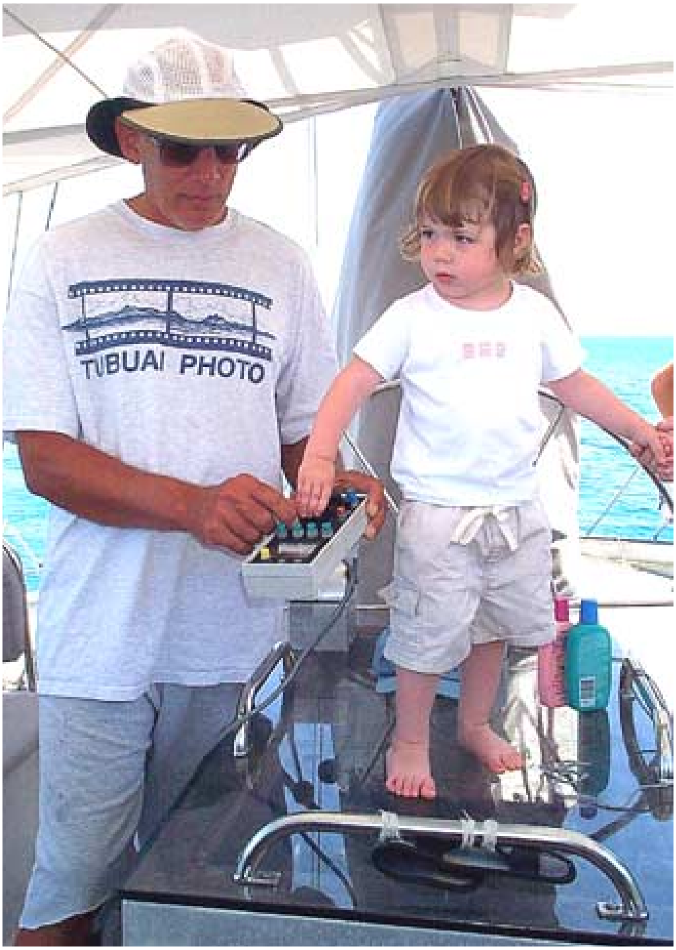
Vibration

Vibration is often another indicator. You may not hear a luffing jib or chattering leech, but you surely will feel it. At anchor, the vibration of mast and shrouds lets you know when the wind picks up.

The key to sensing your environment lies in knowing the norm and then being able to sift the variety of signals for the call to action. It is not a difficult skill to learn. It requires only time and the patience to endure the frequent false alarms.

Stay tuned to what is going on around you. Be alert to:

- ❑ Changes in wind patterns.
- ❑ Changes in sea state, even if subtle.
- ❑ Machinery noise and vibration.
- ❑ Pumps cycling.
- ❑ Luffing of sails.
- ❑ Abnormal smells, especially anything with a hint of burning or acridity.
- ❑ Structural sounds (creaks, groans, sliding).
- ❑ Changes in motion.



Breaking in Crew

Now we'll turn to the subject of crew—whether or not they're necessary is open to debate. However, if you do sail with crew—whether they're just along for the ride or actually help handle the boat—it's always a good idea to lay out for them basic shipboard do's and don'ts.

The extent of this briefing procedure depends upon your own style of vessel management, the length and type of voyage, and the idiosyncrasies of the boat.

Some folks use a printed instruction sheet for crew. This document typically covers "guidelines" for guest behavior, safety issues, and emergencies.

Our approach has been more informal on the odd occasion we've had somebody other than the kids aboard with us on a passage.

Our motto has always been "break them in early." Our granddaughter Emma, here aged two, learning the fine points of steering Beowulf through an anchorage under power (sailing through the anchorage comes next year). Note the concentration. She is getting a feel for Beowulf's turning radius.

Lifestyle

We divide the data to be presented into several categories. The first of these deals with our concept of how life afloat should be lived, or at least the way we do things aboard our boat. We start with footwear. Shoreside shoes, even those with boat soles, are stowed. Only bare feet or absolutely clean shoe soles are permitted on our decks.

The next lifestyle consideration is smoking. Some people allow smoking on deck but not below. We don't like it anywhere aboard. Over the years we've found it better to announce this item together with our invitation. Some of our boat-owning friends also bring up their feelings on drinking, drugs, and loud music right at the beginning.

We've found it best to ask about our guest's tendency toward motion sickness. If they're not sure about their sea legs, we suggest they take some form of preventive the night before we head to sea.

Basic rules about water consumption are also in order. Obviously this will vary with the length of your cruise and water storage capacity, but even where water supply isn't an issue we find it good practice to ask for conservation.

The use of the stove should be carefully explained, especially where propane gas is involved. We always emphasize making sure the propane is turned off at the bottle, or the solenoid valve is closed when the stove is not in use.

Electrical procedures need to be outlined. Guidelines for consumption of electricity will, of course, vary. Perhaps more significant are the rules for using generators, their load capability, and the need to turn off load when starting or shutting down.

Head procedures can be a little embarrassing to explain, but it's better to get this over with ahead of time rather than have to overhaul a clogged check valve. We always request that our male guests sit when using the head for all functions. This substantially reduces odor problems.

On Deck

The next general category of information deals with handling oneself on deck.

Rule number one is to always have a good grip when standing or moving about, even in calm conditions. We emphasize that the boat can take an unexpected lurch at any moment, so be prepared. Talking about what to hold onto helps too. Handrails, coaming edges, and house structures are great. As we've emphasized before, lifelines should be used with care, as they're subject to failure at the terminals.

A word of caution is also in order about lines trailing overboard and catching in the prop.

If there are areas of the boat you prefer people to avoid when underway, announce these in advance. Hatches or coamings may be extra slippery, especially when wet.

There are some specific risks about which the guest should be informed. "Stay clear of booms" is one rule. Also, "Avoid placing yourself in the bight of a line." If the guest is forward during a tack, he or she will have to stay clear of the flailing sheets and headsail clew. Some hands-on instruction should be given in the proper use of cleats and winches, especially how to ease off a line under load and how to avoid an override.

With inexperienced guests aboard, we ask them to remain in the cockpit during sailhandling. If we're offshore, and the guests are helping to work the boat, they're asked to wear safety harnesses when leaving the cockpit.

Subjects to cover with crew before they join you:

- ❑ Medical conditions and allergies.
- ❑ Drug policy.
- ❑ Drinking and smoking issues.
- ❑ Special dietary needs.
- ❑ Clothing requirements.

On board topics:

- ❑ Abandon-ship procedures.
- ❑ Man-overboard technique.
- ❑ Fire-fighting procedures.
- ❑ Safety rules for working on deck.
- ❑ Water, food, and power consumption issues.
- ❑ Proper use of toilet facilities.
- ❑ Music policies.

For crew standing watch, advise them when to call the skipper:

- ❑ Traffic.
- ❑ Wind shift in direction or velocity.
- ❑ Sail trim or changing.
- ❑ Changes in sky or barometer.
- ❑ Navigational waypoints.
- ❑ Change in operation of engine (heat or oil pressure).

Emergencies

Emergency preparations are the next area to be covered. Life jacket location is first. Use of the life raft and emergency supplies should be covered. Vitally important is the location and proper use of fire extinguishers. A minute wasted at the beginning of a blaze can mean the difference in saving or losing your boat

We like to review our basic man-overboard procedures, including maintaining eye contact with the person in the water and tripping the marker buoy and flotation ring. Some instruction in emergency use of the radios aboard is a good idea if you're heading off on a long cruise.

Standing Watch

The last area of consideration deals with basic rules of watchstanding. Even with experienced crew, we like to leave written instructions about the operational parameters for the current leg of our voyage, and when we want to be called on deck.

Our major concern with a crew on watch is traffic, especially at night. Reading the running lights of another vessel can be difficult for all of us, and we would rather make the final call in a crossing situation rather than leave that responsibility to the crew.

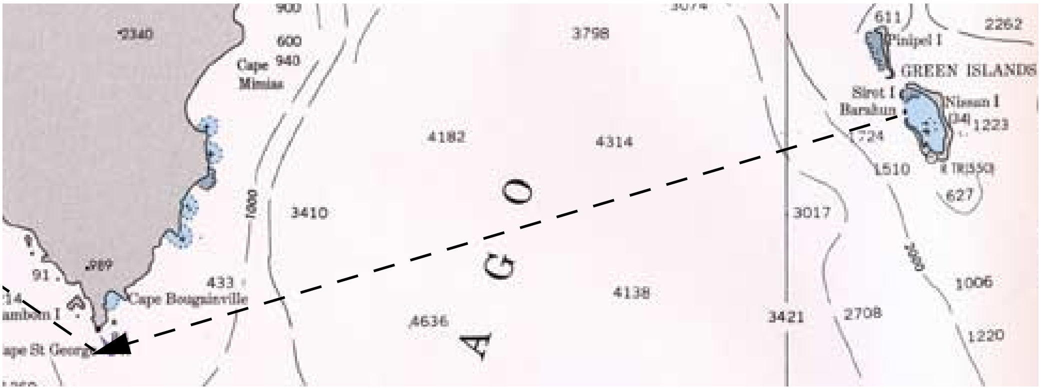
We leave a written set of notes in the log book detailing under what conditions one of us should be called. And we emphasize that we want to be called whenever the watchstander has *any* doubt.We never sleep as well with someone new on watch, but if we are confident we'll be called for anything unusual, we rest more peacefully.

Another area that seems to raise problems is compass reading. While moving the lubber's line to the right spot on the compass card seems pretty basic to most cruisers, to a neophyte it can be a difficult concept to grasp. Practice under the eye of the skipper or an experienced crewmember is essential.

Watchstanders should be acquainted with the natural sounds and vibrations of the vessel, and should call the skipper if any changes are detected. Stress the significance of keeping magnetic items away from the compass.

Explain the importance of night vision for those keeping watch, and make it clear that other members of the ship's company should avoid the use of bright lights.

Last, if your guests will be joining you for an extended period and are shy on experience, there are many good books available on life afloat and basic seamanship. Ask your crew to read one or two before coming aboard.



Offshore Visibility

We are four hours out of Nissan Island in Papua, New Guinea, heading for the bottom of New Ireland. The trades have disappeared, and the sea is like glass as we slip along at 6-knots with *Intermezzo's* little diesel purring below. Since our radar hasn't seen much action in the previous month of daysailing, we are running to keep things loosened up.

Nissan Island is at the very top of the Solomons, opposite Bougainville which used to be part of Papua New Guinea. Our course took us right across a busy (for this part of the world) channel.

The moon has set, but a beautiful net of stars hangs overhead. It isn't too long before we are crossing the favored track of ships heading to and from Kieta on Bougainville Island. On this evening we are surprised by the amount of shipping: six moderate-size vessels and one large-size bulk carrier. Even more surprising is that only one out of the six shows up with radar interference on our set. The other five are not using their radars.

We can see them clearly, except in the occasional rain squall which blocks out their running lights.

The problem of small-vessel visibility becomes even more acute at sea, out of the shipping lanes. As the waves increase and mist starts to hang, visibility worsens. Out of the shipping lanes there's still a surprising amount of large-vessel traffic. The watch on the bridge, if they're looking at all, are intent on other big ships. A small speck of a hull or sail may well not catch anyone's eye.

Needless to say, under these conditions it behooves the offshore cruiser to keep a sharp lookout. Nobody else will be looking for you.

Radar Visibility in Sea Clutter

What if the eyeball contact won't work due to weather or sea conditions? How visible is a small yacht on radar? We've talked to officers aboard large ships in ports all over the world and the answer is disconcerting.

If a sea is running and there's some water in the air, a small yacht, even with a radar reflector, is going to show up as an occasional dot among the other dots of what is referred to as "sea return" on the ship's radar.

If you have radar yourself, you know how difficult the phenomena of sea clutter can be. To a ship it is much worse. With its radar antenna so

Help

Dark sails are not only easy on the eyes, they are much more easily seen by other vessels.

high above the water—sometimes 100 feet (30 meters)—this gives the radar a much better angle to the waves, which then reflect a stronger radar echo. As a result, a yacht becomes almost invisible.

Typically, inside of six to eight miles the ship can only see sea clutter.

A large fixed radar reflector at the masthead will help substantially, but the return it gives is so small in relation to what else is seen on a radar screen that you cannot be positive you will be identified.

Numerous times in foul weather off the coast of Africa we've called ships to advise them of our position. The answer would usually be "Ah, yes, we see your target now!" (Translation, "Now that we're looking for you in the spot you told us to look, we can pick out your return from the other radar echoes.")

You've got to see them first and advise the ship of your presence.

Daylight

The biggest problem, it seems to us, is during the daytime. Everyone at sea relaxes their vigilance, aboard yachts as well as big ships. But this is the time, in many cases, when small vessels are the least visible.

If a good breeze is creating whitecaps, a ship will have to be quite close to you before the lookout can distinguish your sails and spars from the waves. And that's too close for comfort.

What can you do? Several yachts we know have tan sails. These are not only easier on the eyes at sea, but are definitely more visible. Another approach, not quite so traditional but nonetheless functional, is to have a

Help

colored stripe across the top of the main and working headsail, or even to make the whole top section colored. It may look strange, but it's effective. Several sailcloth makers now offer a "rescue orange" Dacron, typically restricted to use on storm canvas.

At one time masthead strobe lights were very popular with small boats. However, their use should be discouraged as they tend to kill the night vision of anyone close by, and it is impossible to gauge distance to a strobe.

If you do use one in an emergency to attract attention, be prepared to switch to an incandescent bulb when your rescuers are within a couple of miles, so they can find you. Otherwise, the strobe gives no indication of how far away you are.

Running Lights

A masthead light has a far better chance of being seen by another vessel than deck-level lights. It is not lost in the waves, as are the lower lights. We've had ships report to us that they can see our masthead light at four to six miles with a 12-watt bulb, and six to eight miles with a 25-watt bulb.

The cleanliness of the lens on your masthead light has much to do with its range. Give it an occasional polish.

If your tricolor bulb burns out, use the anchor light. While this is not legal, it still gives you a significantly better chance of being seen than deck-level lights.

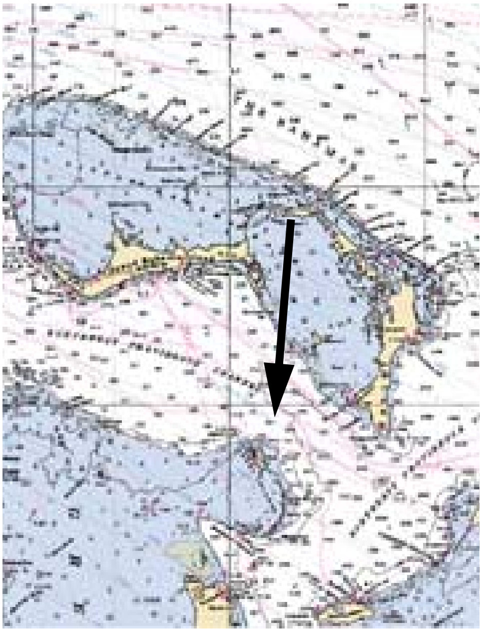
Close to shore and in port, however, we feel it is best to use deck-level running lights. To other small vessels, these are easier to interpret.

Northeast Channel

Finally, there's no substitute for eternal vigilance. This basic rule of the sea was underlined for us at the end of our voyage on *Intermezzo*, when we were sailing through the Providence Channel of the Bahamas toward Florida.

This was our last leg after three-and-a-half years of foreign waters. I was on watch and keeping a careful eye out for both the confines of the channel and the tremendous amount of shipping around.

It was Linda's turn to be in the sack, but she was restless and as keyed up about our Florida landfall as was I. Checking the horizon carefully, I slipped below for a cup of coffee and a hug. The coffee had not had time to cool down to a drinkable state when I felt, or perhaps heard, a strange sensation: a steady vibrating throb. It took just a second for it to register that I was hearing the screw or engines of a very large ship vibrating through the water. A rush topside shocked me with the sight of a 20,000-ton cargo ship sliding by our port side, not more than 100 feet (30 meters) away. Had he seen us? Not if he passed that close. How had I missed seeing him? I don't know. But from then on, in shipping channels, we resolved never to leave the deck unattended.



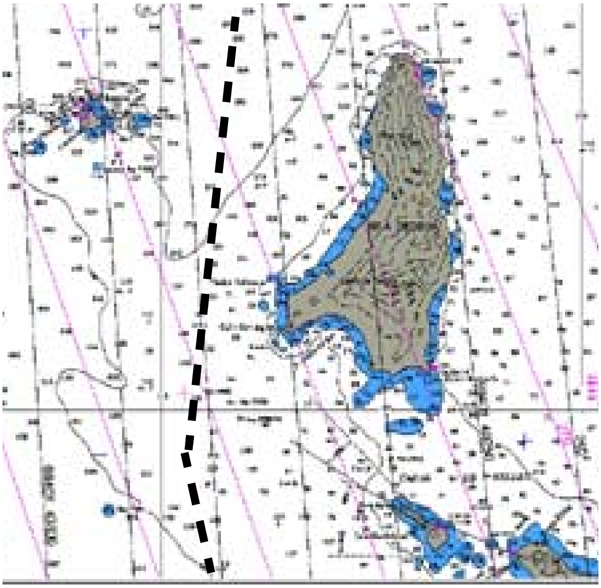
The Northeast Channel in the Bahamas is a busy place for shipping. It is the quickest exit from Southern Florida to the West Indies and South America. The channel is relatively narrow and it behooves the cautious mariner to keep a very sharp watch. Our close call occurred at the point of the arrow.

If there is any question about how to read range lights or masts on ships try making a model which you can use to simulate different situations. A small piece of wood, with a short forward nail, and longer aft nail, will give you the same relationship as with a ship.

Avoiding Collision

As we've been discussing, one of the biggest concerns for the person standing watch will be shipping. And although most ships stand reasonable watches, when it comes to avoiding collisions they are on the lookout for other ships, not small yachts.

As we've said before, at night when you display a masthead tricolor light, your chances of being seen are better. But if other large vessels are about, you can bet the watch aboard the ship is busily plotting their course and speed, which leaves little time for a strange soft light on the horizon. From a practical point of view, the responsibility for avoiding collision with large ships rests with you alone.



The back side of Cedros Island, off the Baja California (Mexico) pennisula, makes a turning mark for ships heading up the Pacific Coast. As such, it is one of those places where tracks of ships tend to congregate. In such locations, it pays to keep an extra sharp lookout. The dashed line indicates the typical ship track.

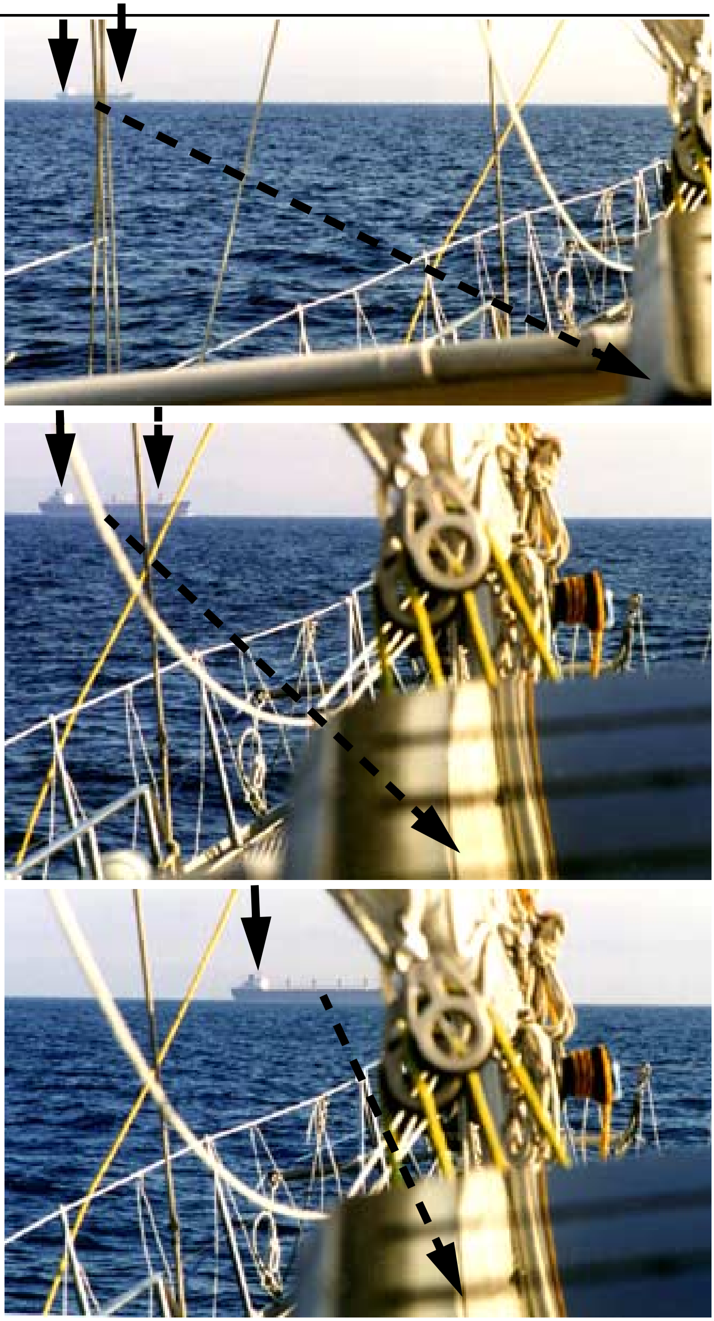
Simply identifying the presence of a ship is, of course, only the first step. You must be able to figure out its approximate course and speed, while factoring in special considerations such as the other commercial shipping it may have to avoid. If you don't pay careful attention to identification lights at night, it is easy to become confused as the following story illustrates.

Night Watch

A light northwesterly breeze pushes the yacht towards the tip of Baja California. With main, mizzen, reacher, and mizzen staysail set, the 45-foot (14-meter) ketch *Far Horizons* is making good time tonight. The bow wave sings a gentle song, while the occasional whoosh of a porpoise coming up for air keeps the watch alert. To port 10 miles away looms the outline of Cedros Island. With a gibbous moon and clear sky, this high island is clearly visible.

From time to time the skipper, John Hamilton, checks the compass and the self-steering and then has a look around the horizon. It has been 10 days since the boat left San Francisco heading south. In the last three days, not a ship has been sighted. Yet there is plenty of traffic out here.

A curious porpoise breaks the water's surface next to the cockpit. As it gulps in air, John is startled into wakefulness. For a second he isn't sure where he is; then realizing he has fallen asleep, he quickly stands up and braces himself against the mizzen boom with his right arm. Ahead, just off the port bow and under the foot of the reacher, he can see the glow of lights. Quickly he scans the rest of the horizon and then settles back to study the lights forward. There are two clusters that appear to be separated by some distance. Without bothering to reach for the binoculars, he decides the two clusters are a tug and a tow. Somewhat groggily he thinks to himself, "I've got plenty of time. If it is a salt barge coming out of Scammon's Lagoon, it can't be making more than five or six knots."



How a crossing is supposed to look. The bearing to the ship is constantly changing. And as long as it is changing, a collision course does not exist. In this series of photos it is obvious the ship is going to pass well ahead—which is the way you want things. It is always better to have the ship cross you. This way you have the option of slowing down to put more space between the two of you. In the opposite situation, where the ship looks to be taking your stern, the only option you have to increase separation is to speed up, a more difficult proposition.

Help

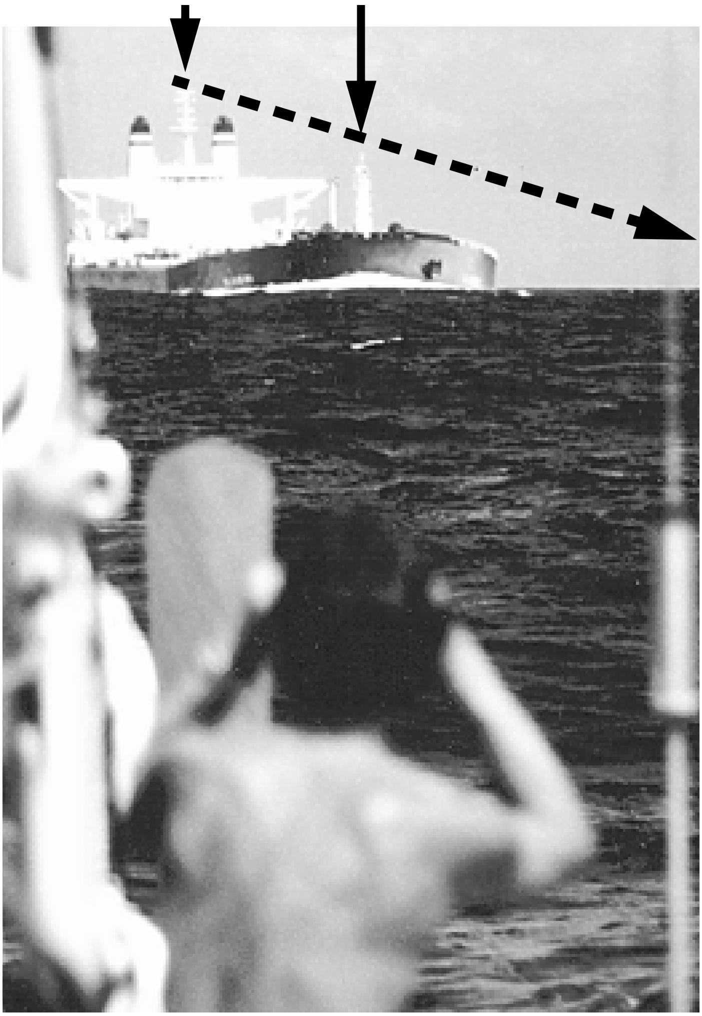
In the photo below (looking aft over the stern of the sailboat) look at the alignment of the two masts (under the black arrow). The forward of these is swung to our right, which indicates the direction the ship is traveling relative to the camera. As long as the bearing continues to change, he will pass—in this case, as you can see, off the port stern.

He ducks below for a moment to get the coffeepot brewing, but something troubles him as he reaches for the propane valve. He realizes he hasn't made a positive identification of the lights; he didn't pick out the steaming or towing lights. The coffee now forgotten, he fumbles in the companionway for the binoculars and rushes on deck.

Daytime Interpretation

One method of checking a ship's heading in daylight is to study the relative positions of the bow and bridge on the ship. If the two are aligned, the vessel is heading directly for you. If the bridge or aft masts seem to be swung out towards you, it means the heading of the ship is forward of your bow. If the bow appears closer than the stern in angle then the vessel is heading astern of you.

If the relationship of these angles is similar to compass bearings; if they stay constant, regardless of bow and bridge orientation, you are both on a collision course.



Vicky Carkhuff

Relative Bearings

You must be able to determine quickly if a collision will result should you and the other vessel maintain your respective courses, and if so, what action you should take.

Taking relative bearings is the simplest method of answering the first question. Using your compass, note the bearing of the approaching vessel. If this bearing remains constant over the next minute, the two of you are on a collision course. If the angle gradually widens, the ship will pass by your stern, and if it is closing, it will pass you by the head.

The lights are much closer now. The skipper's first fear is that he will be caught between a tug and tow.

Then, with a jolt, he realizes the lights aren't a tug and tow at all but a single giant cruise ship. The massive deck illumination has hidden the running lights. Without bothering to pick the steaming lights and positively discern the liner's course, he throws the autopilot off, puts the yacht about, and then turns on the engine to assist. But the ship seems still to be bearing down on him.

Altering Course

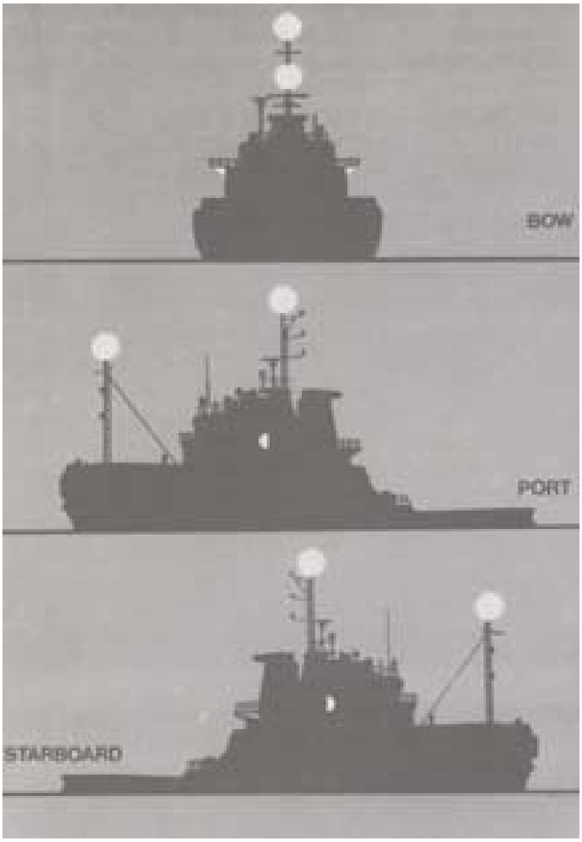
What do you do when on a collision course? If there is room, we always prefer to take the ship's stern, rather than try passing by the head. Commercial shipping generally moves at 14 to 20 knots, and the rate of approach is always deceiving. By taking the big fellow's stern, you have more flexibility about your own course, to the point where you can reverse if necessary.

The liner is so close now that without his binoculars the skipper can pick out the steaming lights. They are lined up on top of each other; the ship is heading directly for him! Once again the helm is put over; and this time he gets clear, but the liner passes close enough astern for him to feel the throb of the engines.

Had the skipper of this ketch used his binoculars when he first sighted the lights, he would have been able to tell both the type and heading of the vessel, rendering the last-minute maneuvering unnecessary.

How to Read Steaming Lights

The steaming lights, mounted on the bow and a high mast amidships or aft, give pointed indicators of a ship's course. Lined up on top of one another, they are like range lights—you are looking down the centerline of the ship. If the bow light, which is lower than the aft light, is towards you, the ship is on a heading that will cross astern of you. If the bow light is away, the ship is heading past your bow. And if the relative bearing stays the same, you are on a collision course.



Reading the range lights on a ship is quite simple, once you've gotten the hang of it.

In the top drawing the ship is headed right for you with the lights aligned on top of one another.

The middle drawing, with the forward light off to port relative to the aft lights, is passing to port.

The bottom drawing is heading to starboard.

Avoiding collisions:

- ❑ Make sure the bearing between yourself and the other vessel is changing.
- ❑ Try to anticipate what other obstructions (navigational or vessel) to which the traffic may be responding.
- ❑ Identify lights or movements early.
- ❑ When in doubt, get a second opinion.
- ❑ After a clearing angle is established, continue to keep a close watch until clear.
- ❑ Always take the other vessel's stern when possible.

Help

Left: Exactly what you do not want to see. This ship is heading almost directly at the camera. The very slight mis-alignment in the masts indicates that it will pass to the side, but far too close for comfort. A slight change in course would result in a head-on collision. Assuming you are headed towards the ship, the correct course change here would be to starboard, away from the ships bow. If the ship were overtaking the turn should be to port.

In the photo (right) below we are passing a ship, port to port in Gatun Lake, while transiting the Panama Canal. Normally we'd never allow ourselves to get this close to a large vessel, but in the Canal it is unavoidable.

As the suction effect between hulls is a function of relative boat speed, and we're both moving slowly, it does not present a problem in this situation.

These three photos (above left and lower two) were taken as we were sailing up the Delaware River on the East Coast of the US, towards the ship in view. Note the alignment of the range on the upper left photo. It appears to be almost on us with a slight bias towards our starboard side. By the bottom left photo, four minutes later, you can see that the angle is changing. With the lower right photo it is now apparent that this ship will pass us starboard to starboard.

If we were to change course in this situation we would do so to port, away from the bow of this ship. However, if he were overtaking us, we'd change course to starboard.

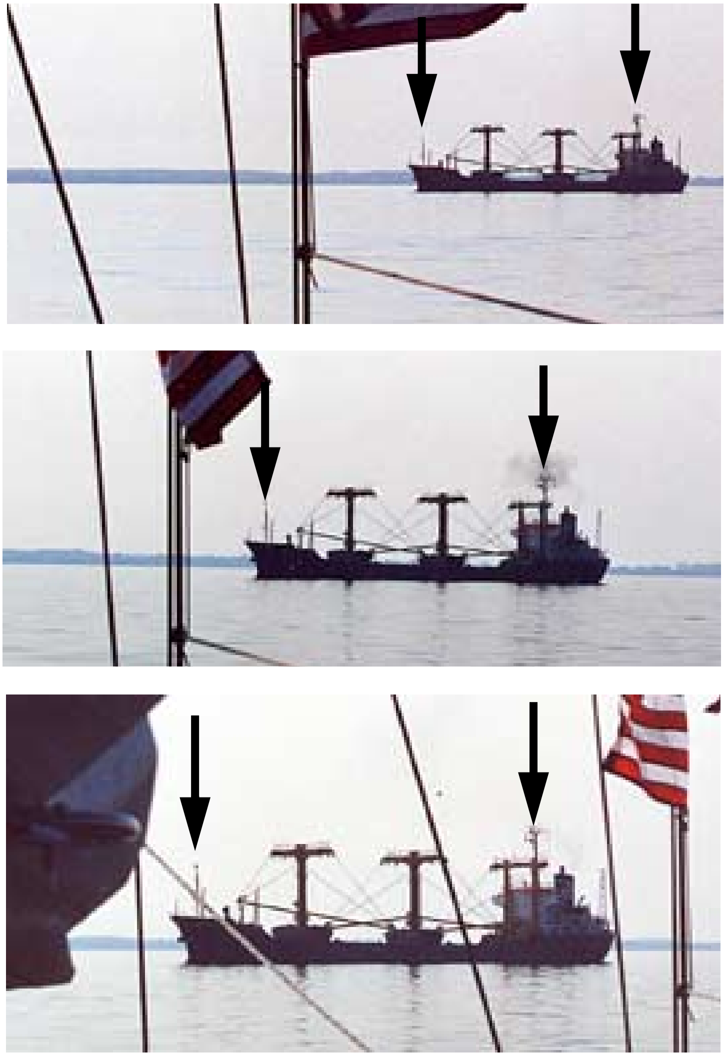
We shot these four images, and those on the next page using anchored freighters to show alignment of the ship's ranges. Upper left and the ranges (spars or lights) are on top of each other which means the ship is headed directly for us.

We are on a reciprocal course, headed toward the ship. The norm is to pass port to port if there are no other issues involved (traffic, navigational obstacles, etc.) so we alter course to our starboard. If the ship's heading is steady, their leading range, on the bow, should begin to swing away from us, away from our port side, which it does in the top middle photo.

By the third, upper photo the range is moving more to port, indicating clearly we are no longer on a collision course. However, the angle is not that wide which tells us the distance between the two vessels is going to be tight.

The bottom photo indicates we'll pass okay, but again much to close for comfort. If the ship were to alter course to its port even a few degrees we'd be in trouble.

A much safer course for the yacht in this case would be a more substantial swing to starboard, in which case the angle on the ship's ranges would open much more quickly. Note, if the ship were overtaking us, we'd be turning to port rather than starboard.



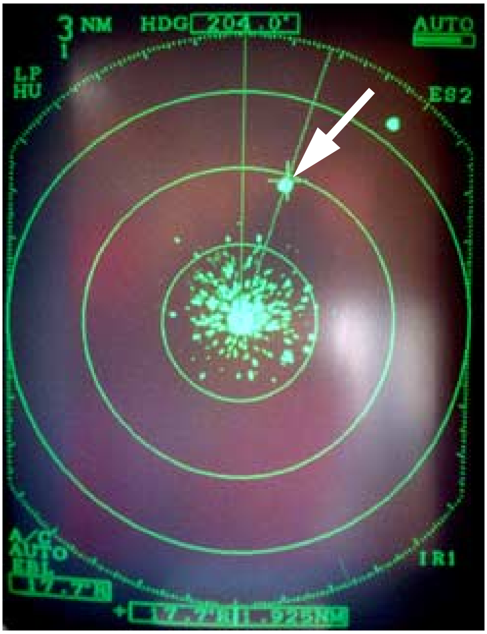
The top three photos have the ship aligned to pass to our starboard (we're heading towards the ship). In the open ocean this would be way to close for comfort and we would head more to port to put more room between us. However, in a tight channel, assuming we were relatively certain the ship would maintain its course, we would allow this close a pass. Note that in turning away from the ships bow we would be turning to port. If the ship were overtaking us we'd turn to starboard (still turning away from the ship's bow).

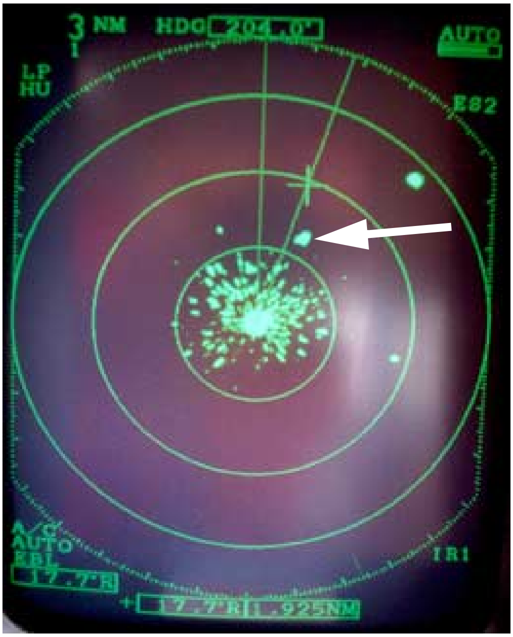
The bottom three photos are of a crossing situation. While the relative bearing is growing, in other words not staying constant, the change is only slight. We would feel uncomfortable with such a potentially close crossing. There are two possible actions. First, by turning to starboard, towards the ship's stern, we would remove any possibility of a collision. Second, by slowing down we could affect the outcome as well. Of these two actions, turning is safer than slowing down. What you do not want to do in this situation is to speed up to try to cross the ship's bow!

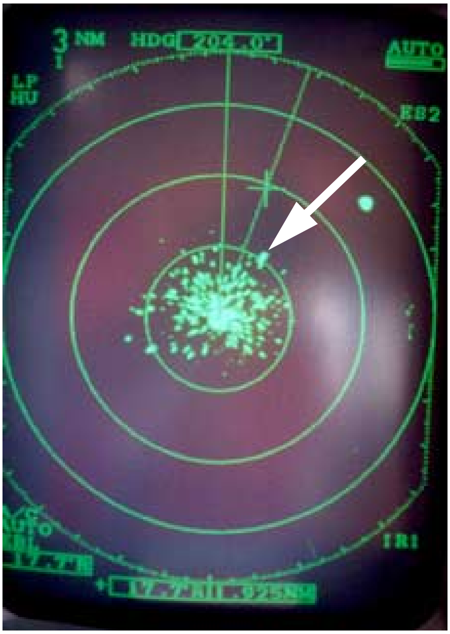
Help

Using Radar to Define Collision Threats

A radar provides you with a means of identifying problems at a greater distance than your line of sight. A bearing cursor can be placed on the vessel target. If the ship stays under the cursor, you are converging. In clear weather, however, when a ship is closer than a few miles, never rely on radar; use your eyes instead.







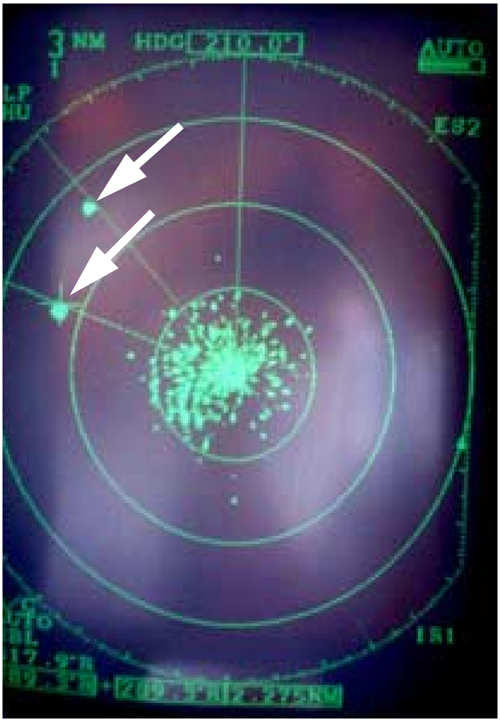
Using radar for collision analysis is quite simple, as long as there isn't too much traffic about. In this series of photos we have a small steel boat, about 50 feet (15 meters) in length, heading towards us. All of these images have been taken at the three-mile range, with electronic target enhancement turned on.

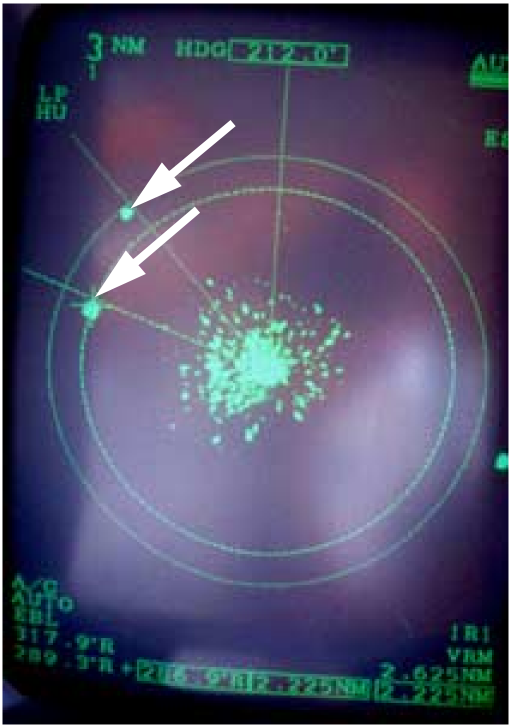
In the upper left photo we've put an electronic bearing line onto the target. We want to see if the bearing angle remains the same. If it does, the potential for a collision exists (the white arrows indicate the target).

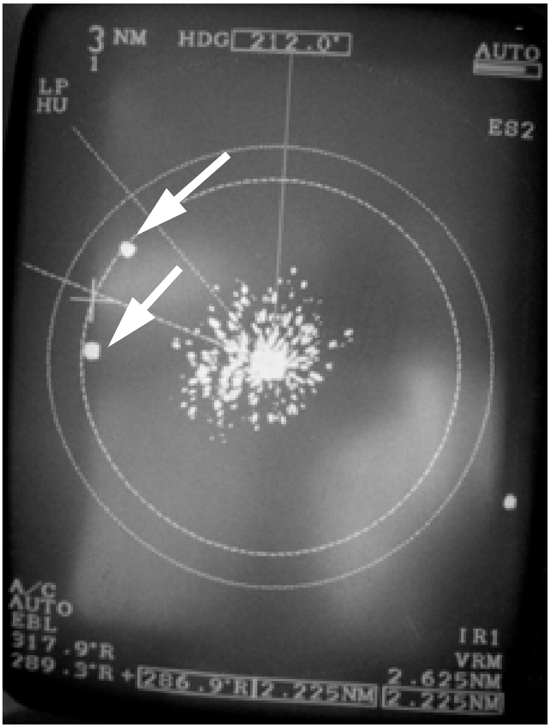
In the upper right image the target has moved about three quarters of a mile and slightly to the right of the bearing line. This indicates the target will pass well to starboard of our position.

In the bottom photo the target is now just on the one-mile (inner) ring. The target is now well off the bearing line.

Sea state at this time was quite light—maybe three to four feet (0.9 to 1.2 meters) high, yet sea clutter is quite significant. Note how the target is about to merge into the area of sea clutter. Turning off electronic target enhancement at this point would reduce sea clutter.







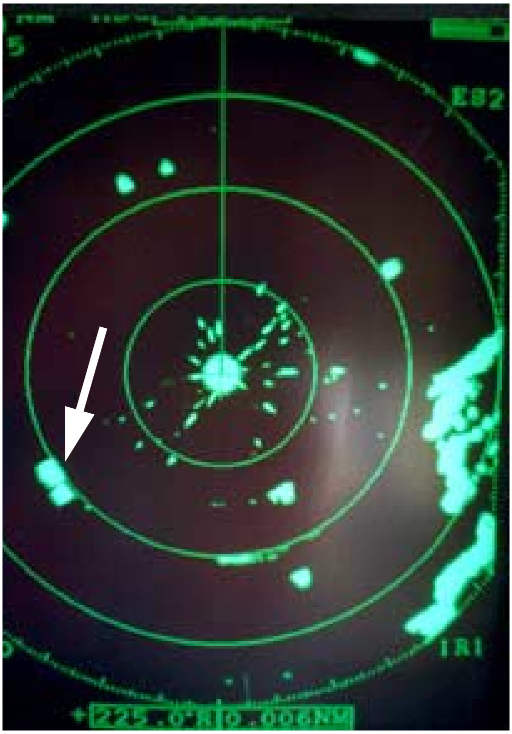
Here we have two targets, making interpretation somewhat more difficult (white arrows point out the targets).

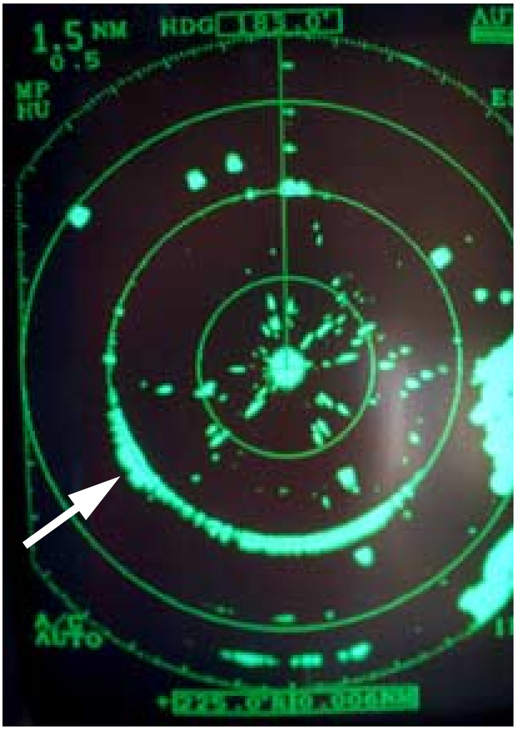
In the upper left photo the radar is set up with normal range rings, in this case at one-mile intervals (the radar is set on three-mile range). As a first shot at checking the course of these targets, the electronic bearing lines have been placed on each target. Most modern radars have two electronic bearing lines (EBLs) and two variable range markers (VRMs).

To make analysis easier, in the upper right photo the fixed range rings have been turned off, and the variable range marker rings turned on. This gives us both the bearing and distance off.

In the bottom left photo we can see that both targets are heading on an almost reciprocal course, with no danger of collision.

Help



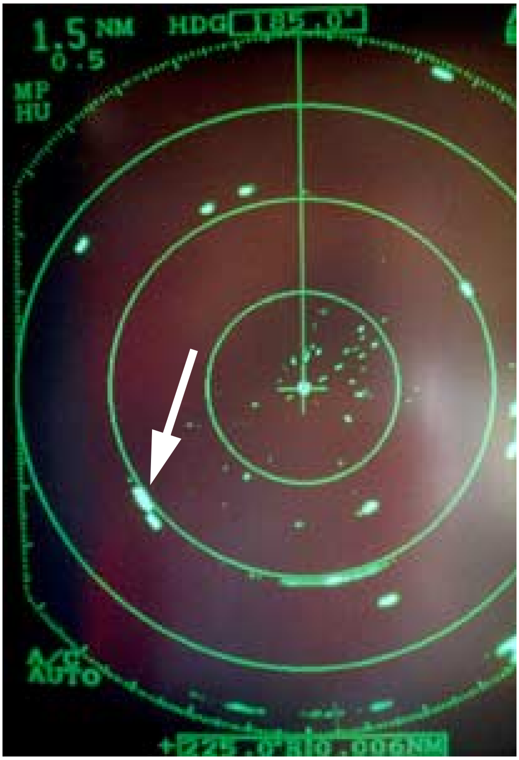


A series of photos of a small tug with a barge in tow.

In the upper two photos the electronic target enhancement is turned on. You can barely see that there are two targets in the left photo. However, this is with a 42-inch (1,075-millimeter) antenna. With a smaller radar antenna the two targets would be merged together.

In the upper right photo we are getting what is known as side lobe interference. In effect, the target is returning too strong a return which shows up as the wide line. You will see this with ships as they get closer as well. The problem is that it becomes difficult to know where the target really lies (in this case at the bump by the arrow).

To get around this problem, turn off the electronic target enhancement, or reduce radar gain settings, as in the bottom right photo.



Talking to Ships

In heavy weather when our own maneuverability is limited and in crowded waters, we try to call approaching traffic on the VHF radio to advise it of our position and ask what avoiding action the master of the ship thinks we should take.

However, you need to be sure that you are talking to the correct ship! If several are in the area, you may think you are communicating with the ship on your port when the one with which you're speaking is actually over the horizon to starboard. This can lead to embarrassing and even serious consequences.In fact, many ship masters refuse to use VHF communications for collision avoidance precisely because of the risks inherent in talking to a vessel in a different location than what is assumed.

"Securité" calls:

When you want to make your presence known to other traffic on a general basis, giving a securité (pronounced secu-ratey) call on VHF channel 16 and 13 makes sense.

Prior to any specific maneuver, for example leaving a confined harbor or crossing a tight channel with traffic around, make the call as follows:

"Securité, securité, securité, this is the sailing vessel XXX northbound through the Hadley Narrows Channels. Standing by on VHF channel 16."

In heavy weather offshore, when visibility is difficult, make a securité call on 16 with position, heading, and speed.

In Heavy Traffic

In crowded yachting centers, evading collision presents a different set of problems.

On the weekends, around the breakwaters of today's major marinas there are often significant traffic jams. With limited space and maneuverability, you have to be ready to contend with the unexpected. Don't assume that the other person knows the rules of the road.

Here the easiest course is to sail defensively and to know how to maneuver your vessel as fast as possible in an emergency (see page 129 for more details on close quarters maneuvering). For example, if beating or close reaching, you will head up more quickly by easing the headsail sheet rather than using the helm alone. Trying to bear off in any sort of a breeze without letting the mainsheet go is like taking the slow boat to China. And most boats will go head-to-wind more quickly than they will fall off, whether you release the mainsheet or not.

Narragansett Collision

It had been a pleasant afternoon sail in from Block Island. A fair wind has *Intermezzo II* speeding up Rhode Island's Narragansett Bay at better than nine knots. With the harbor at Newport just ahead of us, and surrounded by Sunday afternoon traffic with the same destination in mind, we feel our best bet is to power into this new anchorage. Linda takes the wheel as I go forward to douse the reaching jib.

Running off square with the wind, we blanket the jib in the lee of the mainsail. I release the halyard and it slides neatly into a pile on the foredeck. It isn't long before the jib is unhanked from the headstay and stowed in the forepeak.

By this time Linda has worked her way over to the leeward side of the channel and we are far enough away from the boats running in with us to head up into the wind and drop the main. Linda brings *Intermezzo II* slowly into the wind on starboard tack while I flake out the main halyard and get the sail ties onto the boom.

As she is heading up Linda notices a 45-foot (14-meter) ketch about a quarter of a mile to leeward, reaching out on port tack, and heading straight for us. Since we are on starboard tack and now heading upwind, Linda holds her course, assuming the other boat will avoid us.

A few seconds later Linda brings the converging ketch to my attention. From my position at the mast it looks as if they can easily pass to leeward or windward. There are 10 people on deck looking right at us, and it doesn't seem as if there was any particular problem. "Hold your course!" I yell back to Linda and return to getting the main ready to drop.

Linda queries me again, this time with a note of fear in her voice. By now the ketch is just a hundred yards away, doing a steady seven knots, and aimed straight at our midsection. There is a great deal of yelling and gesticulating going on aboard the other boat. A young woman at the helm is obviously confused. At the last moment she decides to duck under our stern. As she puts her helm down her boat heels over, accelerates, and continues to head straight towards us. In the meantime Linda does the only thing she can which is to head into the wind and reduce the angle between the two boats. This has the effect of creating a smaller target, and reduces the impending collision from a direct impact to a glancing blow.

In the last few seconds I realize we are not going to escape. My first although is to avoid entanglement with the other boat after the collision. With the image of their clipper bow and long bowsprit vividly in mind I assume we will have a large "V" notched into our topsides, probably from deck to waterline. I want to be able to get *Intermezzo II* onto the other tack to keep any damage out of the water.

Narragansett Bay is a relatively wide thoroughfare most of the time. But with a horde of boats coming home after a long weekend, the bay was choked with traffic. We had moved to the leeward side (arrow) just before this collision took place.

We collide with a sickening crunch, showering fiberglass and bending metal. Their bow rides up onto our toerail while the bowsprit pokes its way onto our windward side. The ketch bounces backwards from the impact, and, with sails still trimmed and crew transfixed, accelerates forward again to take a second shot at us a few feet (600 millimeters or so) further aft. By this time one of their crew had decided to try use his body to cushion the blow of over 50 tons of boats. While he is moving forward I am yelling at him to get aft and away from the impact area. The last thing I want to see is a human fender.

Their anchor, stored on the bowsprit, is now caught up in our mainsheet. Picking up our deck knife I cut our sheet and let the two boats drift apart.

Intermezzo II has substantial cosmetic damage, but sturdy aluminum construction has held off the charge of her fiberglass adversary. The other boat is less fortunate, as the mounds of material on our deck indicate. Broken bulkheads, an opened bow, and damaged rigging will take them months to repair.

On Reflection

This incident was to replay itself many times in our minds during the ensuing weeks. While we'd had the right of way, and the other vessel's insurance eventually paid for our damage, both vessels were lucky to remain afloat with no more than emotional scars for the crew. If the roles had been reversed—if *Intermezzo II* had hit the other boat—the odds are they would have sunk with almost certain loss of life. That concept scared us as much as anything. Prior to this, while we had kept a reasonable lookout, we had not yet come face-to-face with the responsibility one has for the safety of others when handling a large yacht.

Linda and I were not happy with our actions in this matter. We had made the classic mistake of assuming the other boat would keep clear. After all, they were the burdened vessel. Today, we would be quicker to hit the starter button if required and power out of the way, or take extra measures under sail to be sure we would clear based on our own actions.

The other boat appeared to suffer from a breakdown in communication. It was obvious that a lot of people were looking right at us, but no directions were given to the person at the helm until it was too late. Trying to head away from the wind, with sails sheeted tight on a hard reach, is difficult even in a maneuverable modern design; on a yacht with a long keel and attached rudder, unless sheets are eased, you're going to keep heading straight. Steering up into the wind, on the other hand, would have let them pass us easily to windward, even at the last moment when we were only a few boat lengths apart.

RULES OF THE ROAD

When the Narragansett Bay collision took place it had been years since we had looked at the legal "rules of the road." As we began to work with the other vessel's insurance adjuster (we were self-insured) their adjuster asked us several questions that sent us scurrying to the rule books. The first was, "Were we under inland rules or international waters?" The answer to this question had direct bearing on whom was at fault.

As it turned out, we were not subject to inland rules (by a distance of a few hundred yards), and so received a fair and prompt settlement (there is a purple boundary line printed on NOAA charts indicating where inland rules change to COLREGs).

Given the ever more crowded nature of our waterways, and the growing litiginousness of all segments of life including cruising, it is worth reviewing the rules of the road from time to time.

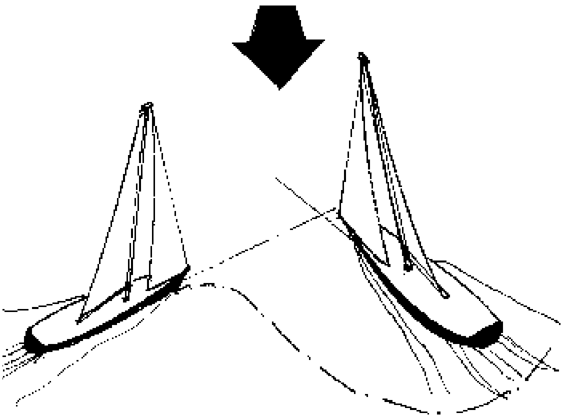
You can pick up a complete set of rules at your local marine book store or chandlery in a US Coast Guard booklet. However, for now let's take a quick look at the basics.

Basic Rules

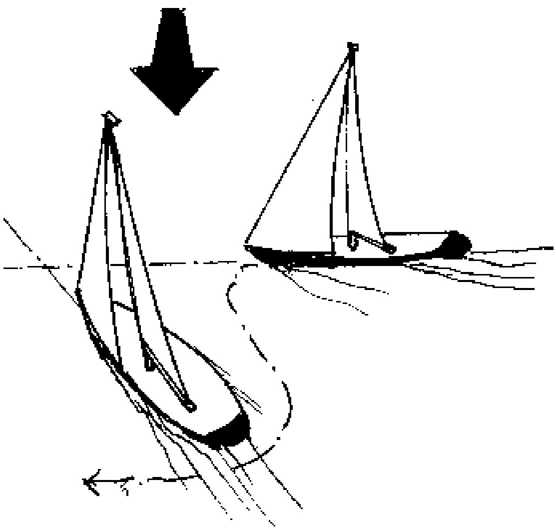
We'll start with this foundation: Regardless of who has right of way, it is the duty of each skipper to do everything in his power to avoid a collision.

Next, might makes right. Even where you clearly have right of way over a larger vessel, it is almost always best to give way well in advance, so that they know you are going to get out of the way.

Confusing this point a bit is the fact that a vessel with right of way (called the stand-on vessel) is supposed to maintain its course, so that the other vessel can maneuver around it. Therefore, if you are



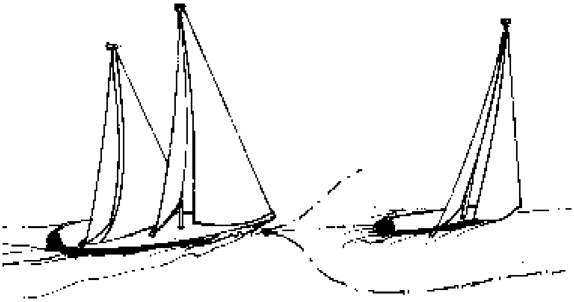
Between two sailboats, the boat on starboard tack (with the wind coming over the starboard side (the right-hand boat above) has right of way. If at all in doubt, the port tack boat should take the other's stern. While this is the rule, when encountering a much larger sailing vessel, especially in restricted waters, it is safer as well as more friendly to alter course to avoid the confrontation well in advance.



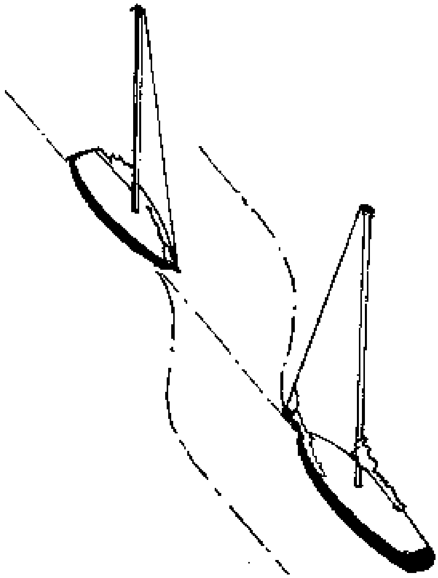
If both boats are on the same tack, the boat sailing closer to the wind has right of way (boat on the left above). This rule is left over from the days before power. If you are sailing high on the wind and have a potential problem with another boat carrying a spinnaker who is the burdened vessel, it makes sense to cut them some slack. They have a much more difficult job maneuvering than do you.

Remember that if you are on opposite tacks, starboard tack has right of way, even if sailing free of the boat on port.

Help



When overtaking (between sail or power and sail) the overtaking boat must keep clear. The courteous way to do this is to sail to leeward of the overtaken vessel. It is best to do this well to leeward since the other boat may not know you are there (most crews typically look forward rather than aft).



When two boats are passing bow-to-bow, the rule is to pass port-side-to-port-side, unless you signal otherwise.

the right-of-way vessel and intend to give way to the burdened vessel, you must do so in a clear manner, well in advance of need.

A moving boat must stay out of the way of vessels which are not moving (whether they are anchored, or drifting).

In narrow channels, vessels smaller than 66 feet (20 meters), vessels under sail, and fishing boats must stay clear of larger vessels which can safely navigate only in specific areas.

In major ports where traffic separation zones are in effect, smaller vessels (as defined above) must stay in the proper traffic lanes. When crossing these lanes, plot your course so as to cross the lane at right angles, which minimizes the crossing time.

Between Sailing Vessels

Between two sailing yachts, the vessel on starboard tack (i.e., with the wind coming over the starboard side—the boat heeling to port) has right of way over vessels on port tack.

If two sailing vessels are on the same tack, that which is sailing closer to the wind has right of way over that which is sailing at a freer angle.

And finally, an overtaking sailing vessel always has to keep clear of one which is ahead.

Between Powered Vessels

Right of way between powered vessels (this includes sailboats with their engines running) is as follows: First, an overtaking vessel must keep clear.

Next, if another vessel is crossing you between your bow and 22.5 degrees aft of the starboard beam (called the "danger zone"), you are the burdened vessel and must keep clear.

If two vessels are meeting head on, where neither is in the other's danger zone, unless otherwise agreed they are obliged to alter course to starboard and pass each other port-side-to-port-side.

There are some exceptions to these rules for rivers and on the Great

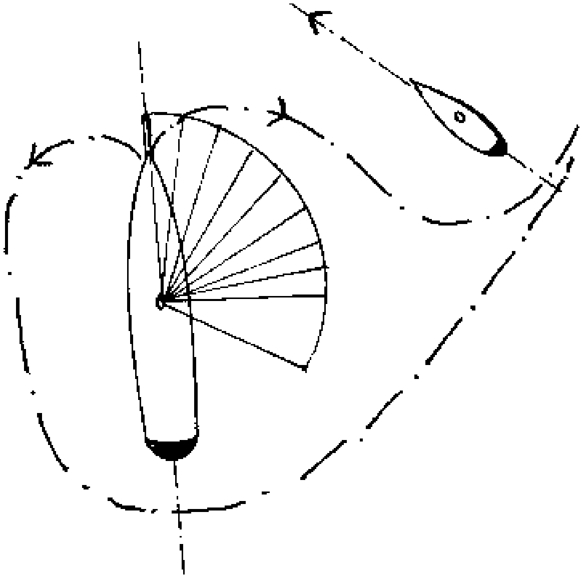
Help

Lakes. In this case, the downcurrent vessel has the right of way, while the vessel heading upcurrent must keep clear.

Between Power and Sail

Sailing vessels have right of way over powered vessels, except when meeting a large vessel which has restricted maneuvering capability in a narrow area. Also, if the sailing vessel is overtaking the powered vessel, the sailing vessel must keep clear.

That's the rule. In reality, as we said earlier, might makes right. In addition, there seem to be a lot of high-speed powerboats running around which don't have a clue, so keep a close eye out and practice defensive seamanship!



The "danger zone" is shown for the boat on the left above. It is from the starboard bow, through an angle of 120 degrees astern. If another vessel is in this area and crossing, it is the stand-on vessel—the one with right of way. You are the burdened vessel and must maneuver to keep clear.

In the scenario presented above, there are three choices for the burdened vessel. One is to alter course quickly to starboard and duck the other boat's stern. The second is to fall off to leeward and jibe around. Last is to slow down or stop.

Signaling

Signaling is required between vessels so that each is aware of the other's intent. These are horn signals during the day and horn plus lights at night. There are specific requirements for height and range of these lights. In most cases, however, your 360-degree masthead tri-color light will get the job done if it is equipped with a 25-watt bulb.

While the use of signals between smaller vessels is rare, if an accident were to occur, the failure to use proper signals could compromise your legal standing.

The signals break down roughly as follows:

First, the danger signal is five short blasts on the horn.

When you signal your intent to pass to starboard, or alter course to starboard, one short blast is used.

Turning or passing to port is two short blasts.

When you are overtaking (in open waters) if you are going to pass to starboard, one short blast is given. Passing to port gets two blasts. If for some reason you could not pass and decide to back down, give three short blasts.

Suction Effect When Passing

When two vessels pass close by each other, or one passes by a large, deep fixed object, a low-pressure area is developed between the immersed bodies.

Help

This low-pressure area tends to pull the bodies together. Once one is close enough for this process to begin, it is sometimes very difficult to get away from the suction.

The first time I witnessed this was during a race in Los Angeles Harbor. It was the annual mid-winter regatta in 1959, and I was sailing my 17-foot (5.2-meter) Wildcat catamaran.

Dick Sutton, my crew, was a grizzled veteran of many races, a real tough character by my standards, and ancient to boot (in his mid-fifties at the time!).

We found ourselves ahead of a big fleet of much larger competitors as we rounded the leeward mark. There was a close reach to the breakwater, and then a beat to the finish line.

Among the many larger catamarans we were racing was the brand new 57-foot (17.5-meter) CSK design *Seasmoke*, owned at the time by the actor Jim Arness.

This was her maiden outing and I suspect there were a few chagrined people aboard as they rounded the leeward mark 30 seconds behind us.

As *Seasmoke* sheeted in her sails, she started putting her very long waterline to work. By the time we were a quarter of the way up the beat she was just beginning to overlap our stern to leeward.

Warren Seaman, who was at the helm, and Dick Sutton had a bit of a rivalry. (I was too young to be involved in this big-guy stuff.) So Warren started pointing his bow up. The distance between us was rapidly closing. He aimed to give us a good scare, plus a dose of backwind.

Even although they were supposed to keep clear of us until they were ahead of our mast abeam position, I was prepared to tack away.

Dick hollered, “Hold your course” and “Mast abeam, keep clear to leeward” to *Seasmoke*.

By this point, 10 feet (3 meters) separated our topsides. The suction between the hulls began to work and within a couple of seconds we were sliding down the larger yacht’s hull, leaving a nice long scratch in the process.

Of course we protested, as they had failed to keep clear. This was not a politically correct thing to do since we were the smallest boat in the fleet, they were the largest, and they had the famous movie star as owner. But protest we did.

The protest hearing was held at the Los Angeles Yacht Club a few hours later. The scratches down *Seasmoke’s* topsides clearly showed they had failed to keep clear. In spite of wishes to the contrary, the decision went in our favor. *Seasmoke* was thrown out of that race and we won the regatta.

Having seen the results of the suction action firsthand, we’ve since made it a habit to stay well clear of other boats when passing!

Expect the Unexpected

We can all learn from situations that went wrong with others. It is a far less painful system than learning the hard way on our own. So we are deeply indebted to friends who have been kind enough to share the following story with us.

The vessel in question, a large ketch with a moderately experienced couple on board as crew, was headed from Panama towards the Cayman Islands.

The first part of the trip, coming out of Panama, had been the usual slog uphill with lots of wind and steep seas. But now they had cleared the worst of the trip and were headed on a close starboard tack reach, with 18-knots of ENE breeze, in a deep water trench between Rosalind and Gorda banks (having just cleared the Quito Sueño and Serrana Banks).

The usual parade of ships heading to and from Panama was present, and they were keeping a close watch on the traffic in both directions.

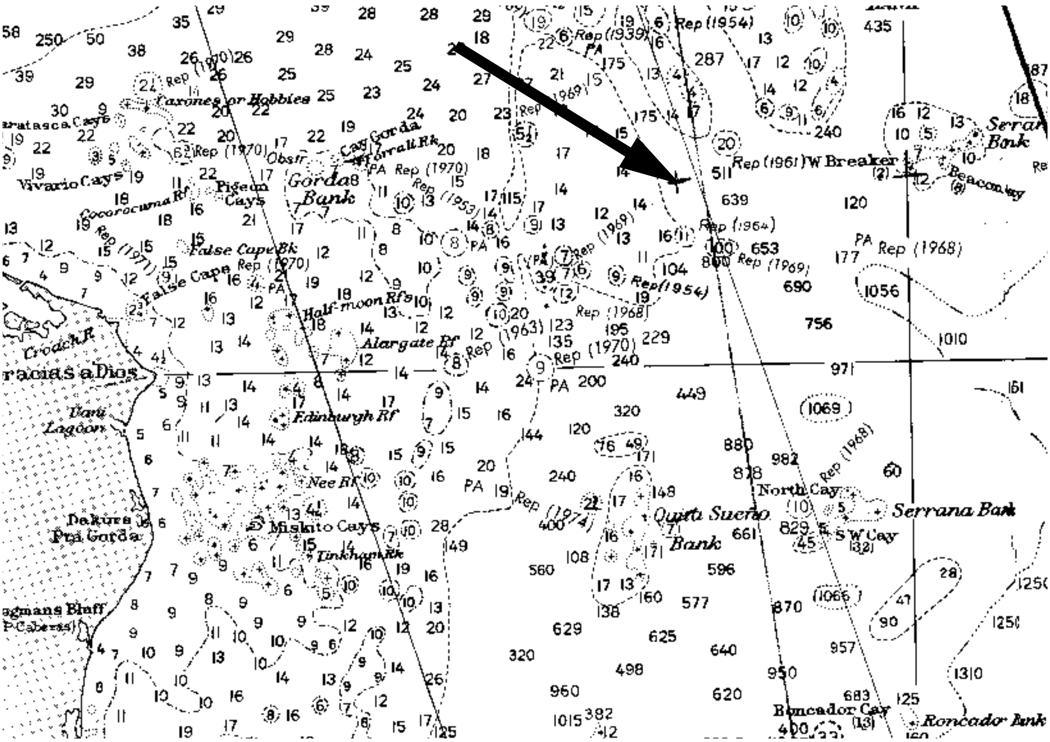
Although they had the option of sailing over the banks (and thereby out of the shipping lane) they chose to stay in deep water to avoid the fishing vessels and accompanying nets working the shallow waters.

They had been sailing with full main and working jib, but as the breeze looked to be increasing, the working jib had been dropped. They were now sailing at 6-knots under main alone in preparation for hoisting the #5 jib.

It was a dark, moonless night, seas were moderate (4 to 6 feet/1.2 to 1.8 meters), and the Raytheon 41XX radar was being used to track shipping.

The chart below gives you an idea of the navigational difficulties getting through this area when heading north from Panama. Shipping is very restricted by the reefs and shoals. Yachts moving through the shoal area have to be especially vigilant for shallow water, while watching out for the many fishing vessels working the productive banks.

The heavy black arrow indicates the setting for the story.



Help

Company

Around 0130 they picked up a large target to the north on radar at a range of 12 miles. Being the only ship in their vicinity at the time, they continued to track it on radar and then made note of the ship's lights soon after they became visible on the horizon.

The closest point of approach was estimated at two miles, and as they were on a reciprocal course with the ship, not a lot of further thought was given to the situation. It seemed logical that within the confines of the deep-water trench there was little the ship could do but continue on its heading, and the two vessels would eventually pass port to port.

The ketch was well-lit with deck level running lights as well as a mast-head tricolor. She was on a heading of 7-degrees magnetic while the ship was heading 187-degrees.

No attempt was made to contact the ship on VHF, nor did the ship try to contact the ketch.

Course Change

At about 0200, with the ship roughly three miles away with a relative bearing of 45-degrees, it began to change course. One crewmember was on watch in the cockpit at the time, the other below preparing to come on deck.

The course change was noted by the deck watch who, after a brief moment, decided to change course away from the ship (to starboard, and onto port tack) so as to be sure to cross the ship's stern. The alternative, altering course by falling off to port, would have put the ketch across the ship's bow.

The assumption on board the ketch was that the ship was making a slight course correction for some reason—and they were responding in kind.

Impact

The ship continued its turn, unnoticed at first by the crewmember in the cockpit. This kept the two vessels on a collision course.

When the watch finally realized that they were in danger, and that the ship was going to cross their bow rather than their stern, it was too late to react.

The ketch hit the starboard side of the ship, a third of the way back from the ship's bow at about a 30-degree angle. The ketch then began to slide down the topsides of the ship, with her bow facing the ship's stern.

The initial impact bent the ketch's heavy Bruce anchor and its supporting bow roller structure.

As the ketch slid down the ship's topsides, some of her standing rigging caught on projections from the ship's topsides, pulling down both spars.

The noise was horrendous, and during the few seconds while they were sliding down that giant hull, the crew (one of whom had been below) was in a state of shock.

They reached for the engine and started it with the thought of pulling themselves off of the ship. However, with the rig tumbling into the water, they thought better of this for fear of fouling the prop.

The ship was clearly aware of their mistake. In halting English the master apologized over and over again on the VHF radio. He offered to accompany the ketch to Panama or evacuate the crew, but would not divert towards Grand Cayman. The ship contacted the US Coast Guard and made them aware of the problem.

The master offered to circle the ketch while the two crewmembers tried to sort out the rig so that they could get under way using their engine. During this period the ship's master kept a spotlight trained on the ketch so that the crew had light to see by.

Cleaning Up

Several of the shrouds on main and mizzen spars had failed in tension and three of the four spreaders on the starboard side of the ketch had been pulled off the mast weldments.

The main mast was broken off below the lower spreader, while the mizzen mast had crumpled mid-span. The spars, standing, running rigging and mainsail were in the water.

The first order of business aboard the ketch was to get the spar pieces on deck and secured, and then remove the rigging from the water so they could use their engine.

The two crewmembers were not working under the best of conditions. It was night; the ketch, shorn of stabilizing sail, was rolling in the almost beam seas; and rig and rigging were quite heavy.

Yet within a couple of hours they had cleaned things up to the point that they could start the engine. After one last look around, they put the engine into gear.

What a relief it must have been to feel that prop turning unimpeded. The crew made a circle around the stationary ship to insure that all was indeed in order, and then proceeded on their way to the Cayman Islands where they made port in Georgetown the following evening without incident.

For many folks just starting out on a cruise, this incident would have scuttled any future plans. But this couple is made of sterner stuff. They had their boat repaired in short order and headed off on 20,000 plus miles of cruising, much of it in areas crowded with shipping.

They are now much more precise in their watchkeeping, keep a careful eye on course intercepts with traffic, and are always alert. And they always expect the unexpected.

In Hindsight

In discussing this incident with us, the owners of the ketch indicated that they felt their mistake was in not expecting the unexpected.

Their initial reaction, to pass behind the ship on what they thought was a slightly altered course, was certainly logical. After all, who would have expected the ship to continue its turn in this relatively restricted seaway. There was no other shipping around, and they'd had no dialogue on the radio requesting a change in course.

Tonga to Fiji

We would now like to share with you what was probably our closest call, from which we learned an invaluable lesson on watchkeeping. This took place in the days before GPS or satnav, but the lessons still hold true.

One of the worst passages that a cruiser on a circumnavigation will face is from Tonga to Fiji. Because of Fijian customs regulations, you must clear in at Suva when coming from Tonga to the east. Yachts are not

Help

allowed to stop en route. This forces you to negotiate several narrow and treacherous passages between reefs—at least one of which will take place in darkness.

Move with us now to the eastern side of the Fiji group. It has been overcast for the last 48 hours. We're approaching one of the Fijian reef "bottlenecks." Linda and I set watches so that I can be on deck from 2000 onward, and while I don't expect to pass through the danger area until 0300 tomorrow morning, I want to be awake during the critical hours.

Later in the evening Linda wakes me. As I stumble into *Intermezzo's* cockpit I am chagrined to see we still have a thick overcast. A slight amount of moonlight is dimly perceivable now and then, as the overcast occasionally thins.

Worst Position Plot

Thinking I may get a moon shot, I bring the sextant on deck. With Linda still awake and in the cockpit, I drop down to the navigation station to work out a "worst possible" position—not where I really think we are, but where we might have been set by errant current. This shows that at about 0200 we'll pass within four miles of the reefs farthest offshore to the north, a reasonable margin. I chat briefly with Brian Marriott, behind us on the Australian ketch *Makaretu*. He feels that we can't be as far north as my "worst possible" position indicates.

Linda bunks down and I assume my watch on deck, enjoying *Intermezzo's* glorious ride through the dark night, just a bit apprehensive about our position.

The wind is blowing a steady 25- to 30-knots from the east, and we're running almost square, with the #1 jib poled out to weather and a full main.

I adjust our course slightly to starboard, and then ease the spinnaker pole foreguy and main preventer. This can now be done from the cockpit, a change made in Tonga. It saves going forward where I might get wet.

We're sailing with a full moon—a normal precaution we always take so we have a chance to get celestial observations during the night instead of just at twilight. The full moon also helps with nighttime visibility of sails, the seas, and of course, any obstructions. The only flaw in this scenario is the aformentioned overcast—with which we've been living almost since we left Tonga.

Moon Shot

At 0145 the moon pops through the overcast. I'm so surprised that I almost miss it, and I'm not sure that my sextant altitude is accurate. I consider waking Linda while I work the sight, but decide to let her sleep. I won't be below for more than a few minutes.

Nervously, I calculate the moon LOP and plot it. When it shows us 16 miles north of our expected position and six miles north of our "worst possible," I shoot up on deck. From my perch in the cockpit I call Brian and inform him of what I've worked out, adding that I don't believe the results, but will keep a close watch just the same. Meanwhile, *Intermezzo* is surfing beautifully off the tradewind seas.

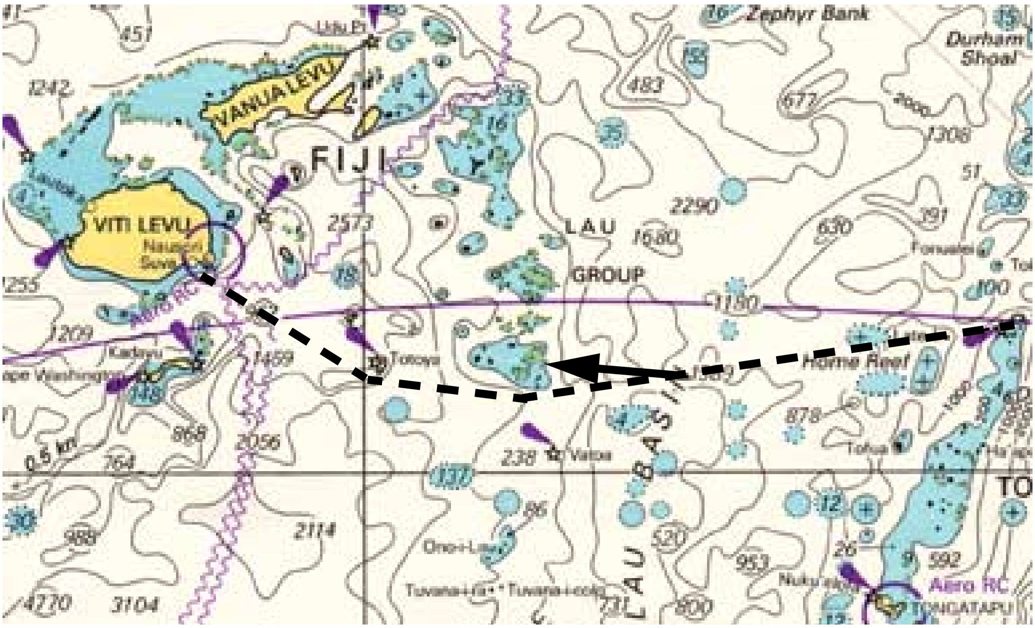
Reef Ahead!

At 0230 we rise to a large wave and ahead of me there seems to be a white line. I blink, and as we rise again, I think I see it again.

Instinctively I grab the autopilot control and turn *Intermezzo* hard to port. As she starts to jibe, I grab the cockpit knife and cut the main preventer and vang lines restraining the main boom. The boom jibes across, fetching up on the starboard running backstay, and forces *Intermezzo* into the wind. Within 15 seconds of my "vision" we are motionless in the water.

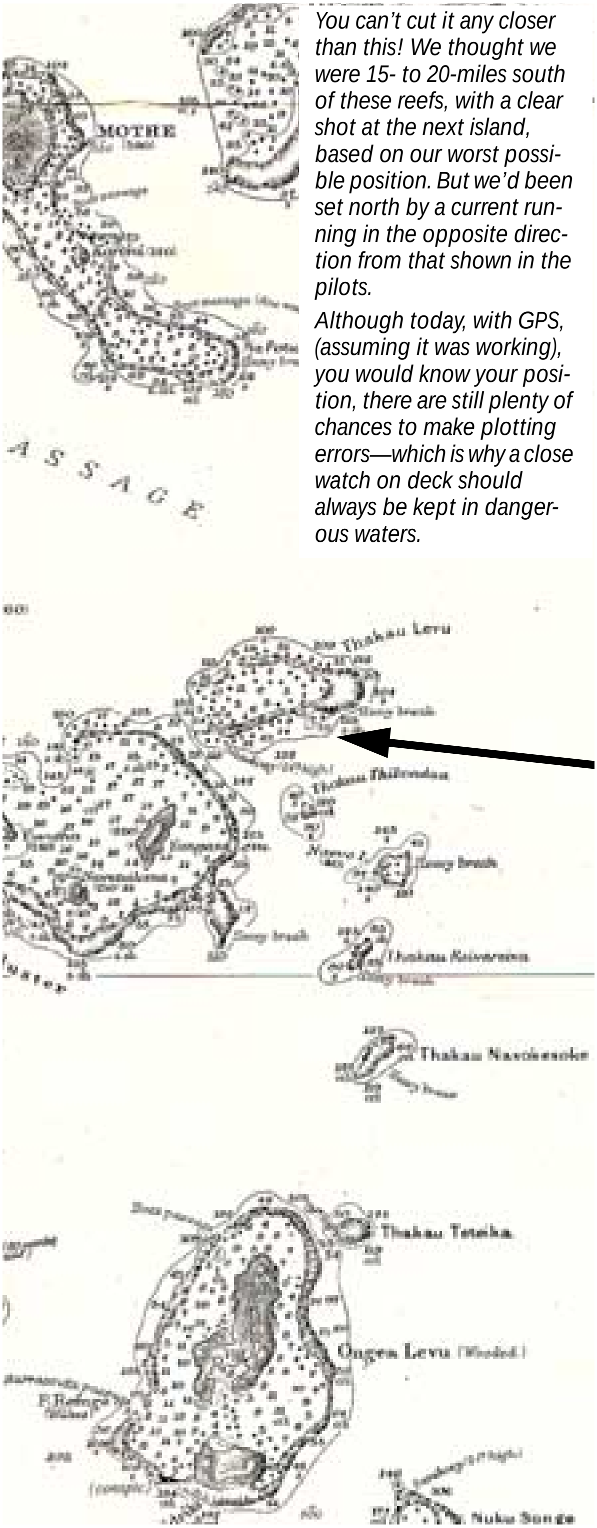
The commotion wakes Linda. She bounds on deck, breathless from an adrenaline rush. We clear our large jib from the pole as quickly as possible. I'm still not sure I've really seen anything, but we aren't taking any chances. Instead of running off in 30-knot trades, we now are faced with working our way back to windward. With the jib furled on the headstay, we set a staysail and reef the main. As soon as possible I call *Makaretu* and advise them of what I might have seen, and that I am leaving our masthead strobe on just in case they're close. Brian replies that he'll slow down until daylight.

For the next three hours we tack back and forth, working our way slowly to windward, keeping a wary eye open. It's possible that we've been set into a horseshoe shape of reefs, and since we can't be certain of our position, all we can do is try to hold our own until daylight. Brian calls on the radio at first light.



The passage between Tonga and Fiji is one of the most dangerous in the South Pacific, with all sorts of detached reefs often invisible at high tide when the waves are low. In addition, overcast is not infrequent. The dashed line below represents what we thought was our track. The solid line and arrow is what we were actually sailing with the effects of an abnormal current taken into account.

Help



You can't cut it any closer than this! We thought we were 15- to 20-miles south of these reefs, with a clear shot at the next island, based on our worst possible position. But we'd been set north by a current running in the opposite direction from that shown in the pilots.

Although today, with GPS, (assuming it was working), you would know your position, there are still plenty of chances to make plotting errors—which is why a close watch on deck should always be kept in dangerous waters.

"Have you seen what's behind you yet?"

"No," Linda replies. We've been too busy looking forward. Glancing aft we see clearly in the first rays of sunlight that we're right in the middle of the horseshoe reefs.

Lessons Learned

That we escaped was due as much to luck as to any seamanship involved. I had made what could have been a decisive mistake when I went below to work the moon sight, leaving the deck unattended for five minutes. Thereafter, whenever we thought we were within 100 miles of reef-strewn areas, somebody was always on deck. With the advent of GPS we've cut this down to 30 miles.

The fact that I had been able to see the breaking surf at a reasonable distance, even with full overcast, brought home even more the value of keeping a good watch.

Given a clear night, without moonlight, a coral atoll with palm trees can be spotted by starlight at a distance of four to eight miles.

One of the dangers with atolls, however, is that they're not always covered with palm trees. Approaching from seaward, it will appear that there are areas of clear sailing between islands when, in reality, barren *motus* or barrier reefs are lurking. If visibility is good this won't prove a problem, but if you aren't on deck to look, you can't tell what's coming at you. Even if it's necessary to go below, be sure to call the off-watch to keep an eye on things until you return to deck.

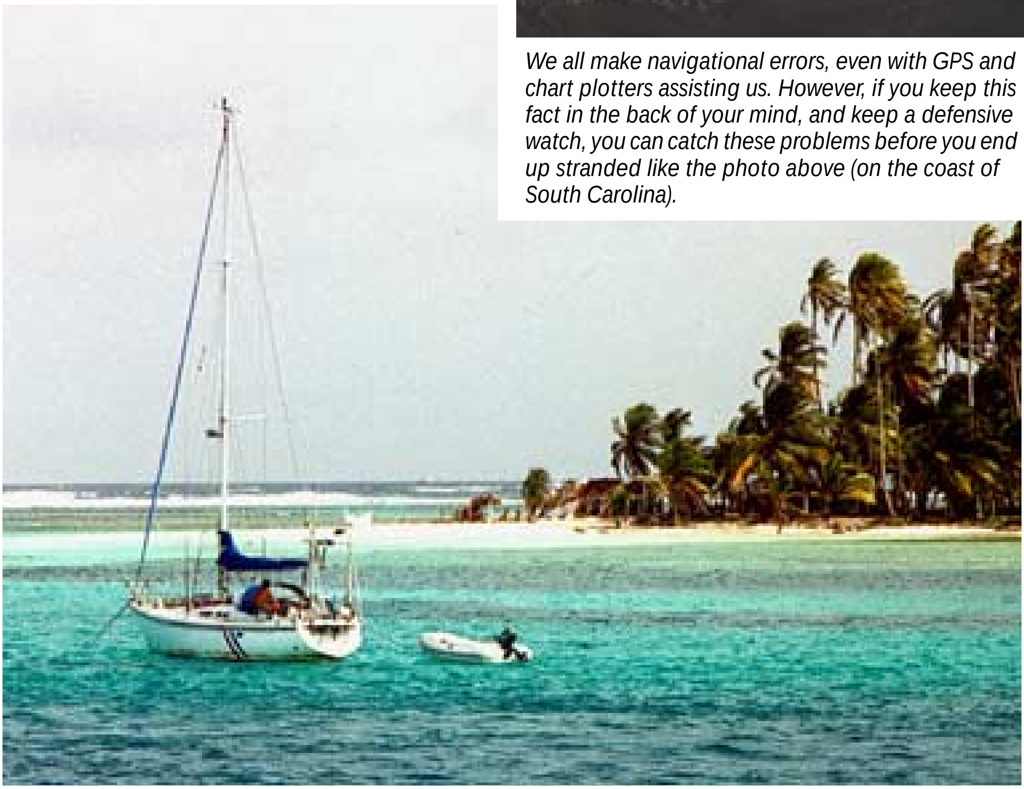
REMINDER—STAY ALERT

Endenbach/Stock Newport

We want to close this section on watch-keeping with a final admonition to stay alert, and a reminder that more cruising yachts are lost approaching reefs and coral islands from seaward—many in broad daylight—than from any other cause. This was true 25 years ago when we started cruising with celestial navigation, and it is still true today despite GPS.

The most common stranding results from a plotting error, but islands and reefs can be mischarted, or you could be using the wrong datum in your GPS. It behooves the cautious cruiser to keep a sharp watch and stay alert!

We all make navigational errors, even with GPS and chart plotters assisting us. However, if you keep this fact in the back of your mind, and keep a defensive watch, you can catch these problems before you end up stranded like the photo above (on the coast of South Carolina).



Another reminder: At the end of every voyage there exists a part of the dream. Maybe it is an isolated anchorage (like the one above in the San Blas Islands off the east coast of Panama), or maybe it's a popular cruising spot filled with old friends. It is worth staying alert at sea and practicing defensive seamanship, so you get there. Safely.

Bruce Goodhue

Bruce Goodhue has been sailing for the last 50 years, 100,000 plus miles as captain on a variety of vessels. These range from dinghies and a 28-foot (8.6-meter) ketch (on which Bruce circumnavigated) to one of our designs, a 112-foot sloop and even a 170-foot Baltic trader.

His thoughts on seamanship echo those of the other professionals we've met over the years.

Emergency Planning

Heavy weather tactics: "I head upwind with a small storm jib until seas get too large, then run with the seas, slowing boat down if necessary with tires, etc. Wind screeching in the rigging always makes things seem worse than they are. Keep warm, drink and eat. Liquid meal replacements, such as Ensure, are good."

Before leaving on a voyage I run through man overboard/ abandon ship procedures with the crew and give each member a specific task to carry out in the event of abandoning ship. For man overboard we go full about, dropping a life ring at the same time, without slackening any sheets, the jib backs, pushing the bow off the wind, the main sets, lifting the bow, holding the yacht stationary, keep watching the person in the water until more crew are on deck before dropping the sail and motoring back to pick up the crew. To abandon ship, I take the radio, one person takes the grab bag and flares and one person organizes the life raft and water. For fire I make sure everyone knows where the extinguishers are and how to operate them. If it's an engine room fire, opening the door can cause rapid escalation.

We always carry a VHF in the Grab Bag...Once I sank after hitting a submerged uncharted wreck at night, in sight of a ship, which did not respond to four parachute flares!

Working with Crew

For any passage of more than two nights we take three or four crew... With three we start watch at 2100 hours - 2400, then 0000 - 0300, 0300 - 0600. On the last watch we usually stay on until someone wakes up (sun coming up, making breakfast, etc.) If tired we wake the first watch of the night. During the day we have no set watches as long as one person is on deck and they realize they are in control until handing over to someone else. With four people we run 2 1/2 hour watches.

We use a stand-alone weatherfax, preset and forget. Have tried the computer SSB systems but the computer is tied up and the SSB is manually set for each transmission, a pain.

When taking on crew for long legs, spend time with them before you sail and if you have any concerns at all, don't take them, look again...Take things slowly, always have a way out. In narrow passages under motor always have a sail ready to unfurl in case of engine failure. Some people never leave port, there will always be some little thing that is not done. Making the first break from home is the hardest, things get easier once you are underway.

Help

Phil Wade

We've known Phil Wade for what seems like eons. Our paths keep crossing (he has captained several of our designs over the years including a record-setting trip in one of the early ARC races across the Atlantic aboard one of our designs, the Deerfoot 2-62 *Moonshadow* (about which we'll hear more in the next section)

He's been sailing 29 years and reckons he sailed something like 500,000 miles on vessels ranging from 30-footers to a 150-foot gaff schooner to yachts like the maxi *Drum*, J-boat *Velsheda* and *Timoneer*. Phil has done ten Admiral's Cup Regattas and crossed the Atlantic 32 times.

Watchstanding

I use the merchant system of instruction, which is good. You have a set of standing orders and then a daily set of what is called night orders. In the standing orders I have instructions that the crew call me "whenever there is any doubt" in any situations and impress upon them that they are to call me for whatever reason and they will not get into trouble. However if they do not call me or call too late then they will get into trouble! Night orders then pertain to specific instructions for the day/night.

The last person who joined shows the new member around all the safety gear. I then quiz the new crew on where it all is to make sure they are both up to speed. We then do drills before a passage and on an ongoing basis. We deploy the man-overboard module at least once so that we know how it works and make a video of it for all new crew to see. Videos are a good way to refresh memories of any equipment.

General Seamanship

Preparation is nine-tenths of good seamanship. Always think of the worst thing that can happen and have a game plan to take care of it. Stay cool, calm and collected and above all use common sense—the biggest asset to seamanship.

If you are just starting out, practice drills, read, learn, especially other disasters. Learn by other people's mistakes and never think it could not happen to you.

In heavy weather, know your boat, keep sailing, know the limitations. Be prepared.

Use the biggest possible ground tackle. I often use two anchors in proximity to other boats or small anchorages—it allows you into places otherwise unobtainable.

In deteriorating weather it is a judgement call whether to stay or leave port. As a general rule I would stay in port but well away from the other boats.

Getting ready to go: "Most of my sailing miles have been on deliveries. When going onto a new boat the first thing I do is make a seacock diagram. This ensures that not only do you know where the seacocks are but also makes sure that you have been through the bilges thoroughly. I then operate all equipment and safety gear, pre-navigate and get as much weather info as possible or necessary. In general I do as much preparation as possible as everything is ten times easier when you are still tied to the dock."

NAVIGATION

There's nothing like the feeling of landfall after a long ocean passage. Above is the northwest corner of Nuku Hiva, in the Marquesas Islands at the northeastern end of French Polynesia.

It wasn't too long ago that navigation was treated as a black art. The "secrets" of the profession were closely guarded, and less than 25 years ago the mysteries of celestial navigation were considered difficult to grasp. This knowledge was a prerequisite for crossing oceans, and acted as a form of cruising birth control. Anchorages were a lot less crowded.

In order to learn celestial navigation (which was not as hard as some would have led us to believe) you had to first understand and practice basic piloting. The piloting skills were what kept you out of trouble between celestial (or other) fixes.

Then along came the first inexpensive satellite navigators. By the mid-1980s the cost of these was down in the same bracket as a windvane steering system, and everybody had one.

Being freed of the necessity of learning celestial navigation meant more folks were heading out over the horizon. Since the satnav typically only gave a couple of fixes each day, you still had to know piloting.

The details of navigation are available in many excellent texts. Here we want to go into the logic of this art, illustrating the rewards of doing it right and the risks of doing it wrong.

Careful navigation is, after all, the cornerstone to a safe passage.

Soon the GPS became ubiquitous, with its ability to tell us our location at any given moment. No waiting for a clear horizon and observable celestial body, no waiting for a satellite pass, just look at the screen and...well, you know the story. Hook this up to a plotter and suddenly the *apparent* need for piloting is gone.

But is it? We would argue that even today piloting and celestial skills are necessary. You can be sure that at some point the electronics are going to fail—at which point these skills become invaluable. Besides, they are fun, give you something to do on watch, and add to your sense of accomplishment in a well-sailed passage.

MOONSHADOW

Before going into some of the details of navigation we want to pass along the experience of a good friend of ours, an experienced sailor who learned some basic lessons the hard way.

George Backhus purchased *Moondshadow* several years ago from her original owner, Mike Gluck. A Deerfoot design of ours, this 62-foot (19-meter) vessel was built conservatively, and engineered to go places.

George sailed her out from the East Coast of the US to the San Francisco Bay area. After this “get acquainted” cruise he went on to sail to Hawaii and back and then down to Mexico. Finally the urge to visit paradise was too strong to resist, and *Moonshadow* was off from Mexico to the South Pacific.

An uneventful passage to the Marquesas led to a wonderful visit in these awe-inspiring islands.

Eventually, however, the lure of the next island group and the desire to discover what was beyond the horizon coaxed them off for the Tuamotus.

Up to this point, the risks from navigational errors were modest. Almost all of the passaging that had been done by George and *Moonshadow* ended with easy-to-spot landfalls, with good radar returns. If he was off on his piloting a bit, he would know it before he got into danger.

Landfall in the Tuamotus

Moonshadow made her landfall in the Tuamotus at Takaroa after 57 hours of powering—the tradewinds having taken a temporary vacation in this El Niño year.

As atolls go, Takaroa is one of the better places to start the learning curve. The barrier reef has almost total cover of palm trees, making it easy to see at some distance, with no detached segments of reef. Also, the trees make for a good radar return.

The pass is easy to enter, although the dog-leg at the end into the lagoon will get your adrenaline flowing the first time you go through.

George and his crew of Eric, Fred and Cort were made to feel at home in the best Tuamotian style.

Heading West

In the era before GPS cruisers planned their passages carefully in the South Pacific. Moonlight was a major factor, as was the weather (we tried to avoid passaging when the trades were disturbed, as this made for poor visibility and a lack of observable celestial bodies).

Departures were timed so that we’d hit the difficult navigation points in daylight.

But with GPS, everyone, ourselves included, has become a bit more complacent.

George and his crew decided to head next for Manihi. They’d been told that the pass was easy to get into, and with an early start they figured they would be there by late afternoon.

They awoke to find the trades had returned.However they did not clear the pass until 1115 and it soon became obvious that, despite carrying a full-sized 2.2-ounce spinnaker, they would not make Manihi before dark.

The foundation of all navigation rests on your piloting ability, regardless of the type or sophistication of electronics.

Even with the most user-friendly and reliable chart plotters, your piloting skills are what will keep you out of trouble. They provide that sixth sense about when things are right or wrong. For example, if the chart plotter seizes up the computer, you’ll need piloting skills to recognize the problem.

It is easy to get complacent with your navigation, given that the GPS lets you know where you are at all times. This is something that we fight all of the time. Plotting on an hourly basis, backing up our GPS with radar, the depthsounder, or a visual observation at times seems like overkill.

But it is easy to make mistakes. It has happened to everyone that cruises. Sometimes you catch the mistake in time. In other situations, the mistake catches you.

It is the near-misses that we’ve had in the past which help to keep us vigilant in the present.

George Backhus comments on leaving Takaroa:

“We were late getting out through the pass, and it is important to note that the tidal predictions were off by more than three hours. When we went to leave at 0800, there was a veritable river flowing out of the lagoon, so we waited at anchor near the “hard left turn” until we could see the flow had stopped before we motored out at low slack water. One other factor worth mentioning is “cruising on a schedule.” While I had no particular schedule, most of my crew did, so we may have pushed on when we should have laid off. “

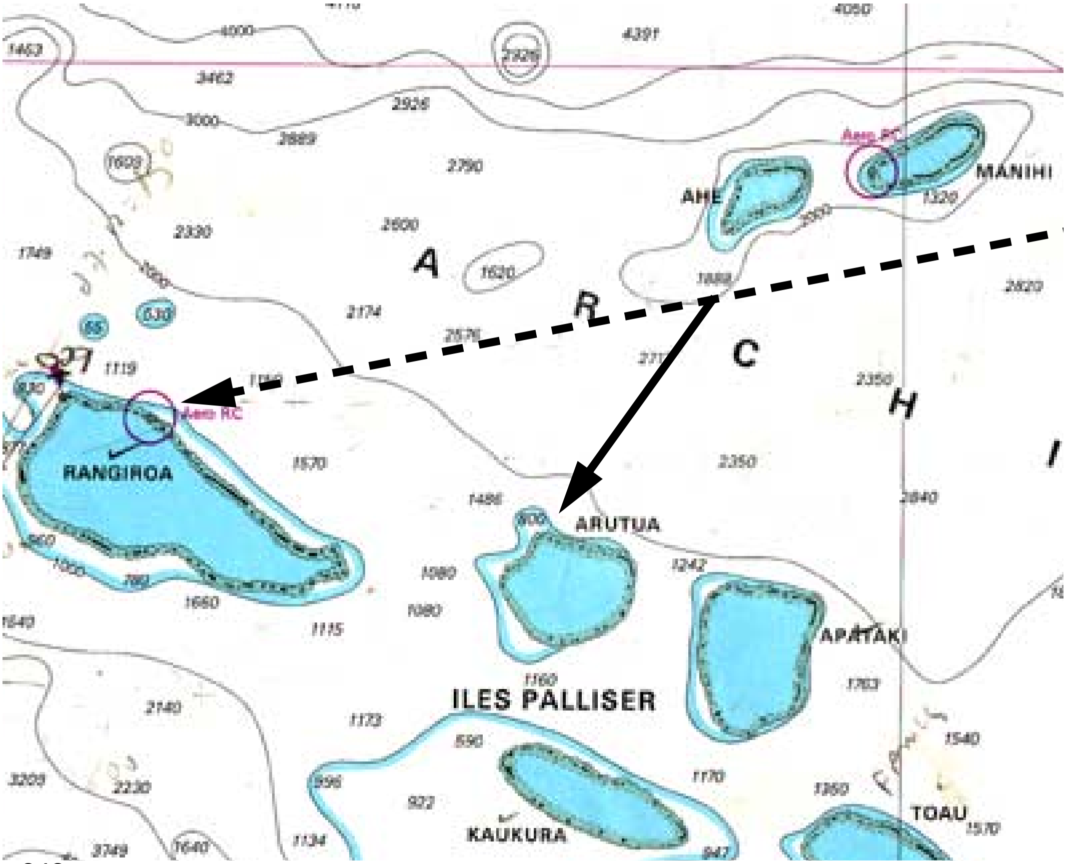
This left them with the option of heaving to for the night or continuing on.The decision was made to alter course to the northwest and head for Rangiroa.

Being an El Niño year the normal tradewind circulation had been fitful, laced with frontal passages and lots of squalls. The squalls in turn made it necessary to keep the hatches dogged so it was quite warm below. The squalls brought major shifts in wind direction and velocity, and nobody was getting much sleep.

Cort plotted a waypoint which would allow them two miles of clearance on the southwest corner of Ahe. From there it was a clear shot towards Rangiroa.

A quote from Cort's journal which appeared in *Latitude 38* picks up the story.

> After dark, I felt uneasy about being so close to the islands and reefs, so I checked and rechecked our progress as we passed Ahe. I turned on the radar for positive identification and to monitor the squall activity, which had increased. We enjoyed dinner as we passed to the southeast of Ahe, seeing some village lights in the distance.
>
> Our new course for Rangiroa was 243-degrees. I did a last



Moonshadow's projected course is shown on the chart below with the dashed line. They had a radar bearing on Ahe to confirm their GPS position about the location shown where the solid line diverges.

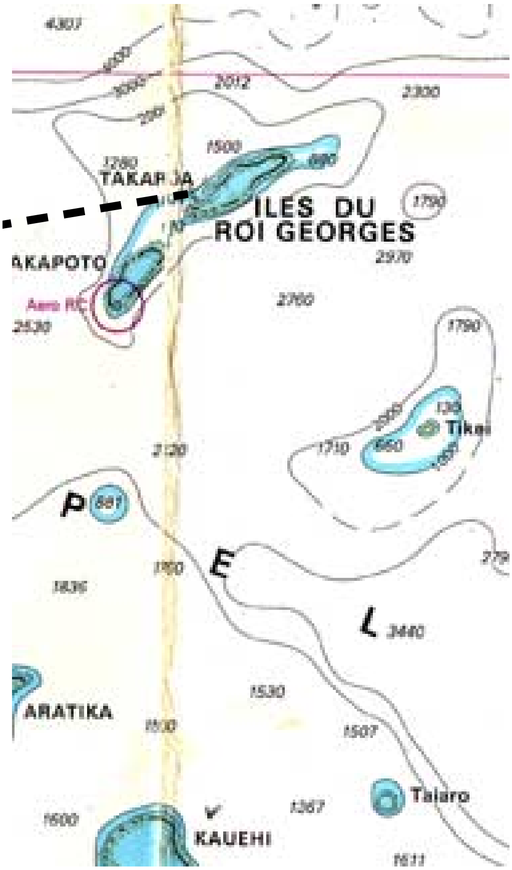
The course that the navigator, Cort, issued is the continuation of the dotted line. Due to miscommunication, however, the actual course was much lower as shown by the solid line. The arrowhead indicates the actual GPS position which Cort transposed further north.

plot before hitting the sack, and told helmsman Eric not to sail below 210-degrees for any length of time as there was an island to the south—albeit way to the south—that could become a problem.

Change of Watch

At 0205 Eric woke me to explain it was squally out and they needed me on watch two hours early. George told me he didn't want Fred on watch alone in these tricky conditions and we'd be jibing in the next lull. Since George and Eric were dead tired, George wondered if I wouldn't mind starting my watch right away. I told him no problem and that I'd check our position.

We were at 15-degrees, 11-minutes south and 146-degrees, 48-minutes west. In my stupor, I erroneously plotted the 11 minutes of latitude to the north—as if we were still in the northern hemisphere—instead of to the south. This incorrectly plotted position put us six miles to the south of our rhumbline course to Rangiroa. The position seemed reasonable to me, as the wind clocking to their east and the squalls driving us south meant we'd been having trouble holding course.



The weather pattern experienced by *Moonshadow* and crew was typical of what is called a tradewind convergence. The squall activity was also what you would expect to encounter as the convergence line passes over.

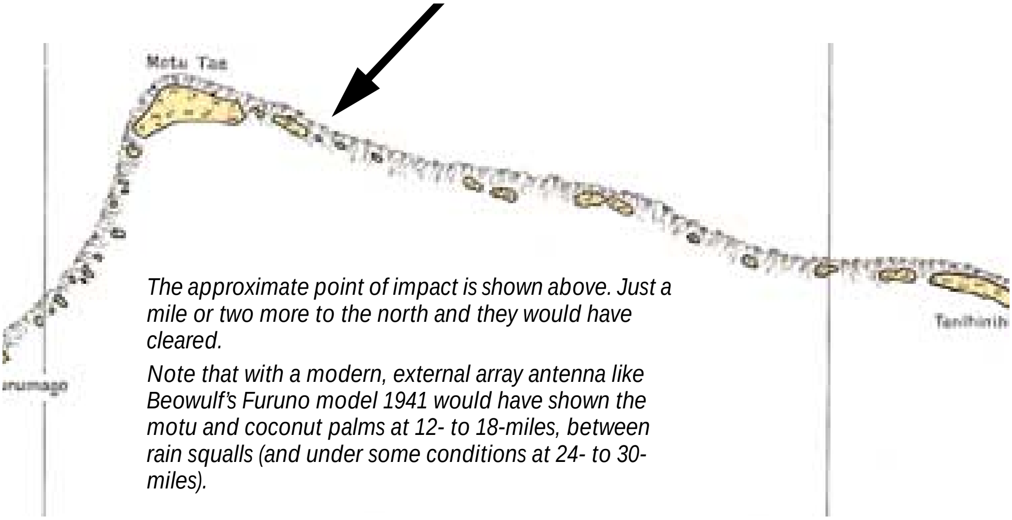
Back to Cort's narrative:

This is when George told me that they were steering 210-degrees, or 36-degrees off the course we should have been steering. Somehow the message not to steer that low for any length of time hadn't been understood.

George picks up the story.

The trades were blowing 20- to 25-knots with stronger gusts in the squalls. We were running downwind with the 130-percent jib to leeward on port jibe with an apparent wind angle of 140-degrees. Seas were 6- to

Help



The approximate point of impact is shown above. Just a mile or two more to the north and they would have cleared.

Note that with a modern, external array antenna like Beowulf's Furuno model 1941 would have shown the motu and coconut palms at 12- to 18-miles, between rain squalls (and under some conditions at 24- to 30-miles).

8-feet. (1.8- to 2.4-meters), and we were doing a steady 9- to 10-knots.

There were three of us in the cockpit and I was waiting for a lull in the wind to jibe over to starboard. Suddenly there was a huge impact, and before we could react there were several more bangs as the surf started pushing us onto the reef.

It happened so suddenly there was no time to react. *Moonshadow* quickly came to rest about 200-feet (65-meters) in from the edge of the reef. She was heeled over at a 50-degree angle, just outside the surf line.

The crew set off their EPIRB, then contacted another yacht, *Walkabout*, on the VHF.

To find out the details of how *Moonshadow* was pulled off Arutua, see page 579. For now we want to discuss what went wrong.

Obviously this is a difficult subject for George to discuss. *Moonshadow* is like a family member to him. Although she was insured, he felt terrible about what had happened to her, and was no doubt distressed by the fact that such a small margin in any number of events would have turned this into a close call rather than something requiring a sea-going salvage tug.

Our initial discussions with George were over the phone right after he'd returned to the States to deal with the insurance issues and decide on repairs. A month later, Linda and I had the pleasure of meeting George in Sausalito aboard *Beowulf*, where we were visiting for a few days.

What Went Wrong

Linda and I were interested in the events which had lead up to *Moonshadow's* stranding, and George was kind enough to indulge our questions on what he would have done differently if he could do it over again.

"The mistake I made," he said, "was to let my guard down. We'd just spent a lot of time on the open ocean where we only needed to plot our position once a day. And, if we were out of position a few miles, one way or the other, it made no difference. I should have insisted that whomever

More from George Backhus:

"Regarding the issue of having a watch forward, in fact, Cort, Eric and I were all sitting in the cockpit when we struck the reef. A combination of being behind the windshield of a dodger, the lack of any moon or star light and the rainy/suspire conditions brought visibility down to two boatlengths at best. Even after we hit the reef, it wasn't until the squall cleared that we could see the palm trees ashore. We actually thought we had found an uncharted reef in the middle of the channel!

"Post Script: Even though the radar was not damaged in the grounding, I have replaced it with the latest Furuno 36 mile CRT unit. I always use it at night, when the visibility is poor or when we are making landfall. I like the 'Watchman' feature for saving amp hours and giving me a tone to remind me to check it every ten or twenty minutes."

Help

There is no sadder sight than that of a beached boat.

In this case, the story had a happy ending on two fronts. First, Moonshadow was eventually towed off without major damage and is cruising once again.

Second, it was the first time we've had the opportunity to see how our "reef insurance" form of construction has worked. All of our boats have had extra heavy scantlings in the turn of the bilge (or a double bottom) to give additional protection. And seeing what happened to this 16-year-old design was very enlightening for us.

was on watch make an hourly plot this close to land. That way, we'd see right away if an error was made."

I was curious if there'd been any warning from the sea before they hit.

"Looking back on it" George went on "the sea had become somewhat confused. But with the squalls around and the wind shifts, I didn't categorize the change in sea state as something to worry about. The next time we will all be a lot more alert!"

Moonshadow has a first-generation Furuno 36-mile raster-scan radar, part of her original equipment from the mid-1980s when she was built. We asked George if this was running while they were on watch. His reply was that they had not been using the radar because between sea clutter and squall activity, it was not useful in seeing the atolls. In good conditions, however, it would pick up an atoll at six to eight miles.

Lessons learned:

- ❑ Plot position hourly so any discrepancies or mistakes show up immediately.
- ❑ Make sure all the crew understand the navigational issues and study the chart.
- ❑ Have someone double-check navigation in tricky situations.
- ❑ Be alert to changes in sea state. Investigate any changes, and double-check position.
- ❑ If you are not 100 percent sure of your position vis-a-vis danger, heave to until you are certain, or you have good visibility.
- ❑ Always keep a watch forward.

A modern set, especially one with an open-array antenna, would see the palm trees at 12 or more miles, even with a large sea running.

In closing, George makes the following points:

It is important that everybody learn from the mistakes and misfortunes of others. The factors contributing to *Moonshadow* hitting the reef were squally weather, poor visibility on a moonless night, some miscommunication between the crew, navigational errors, and fatigue.

With better procedures in place–such as having at least two people doing the navigation in hazardous waters, plotting our position at least once an hour, and having standing orders put in writing–the whole thing could have been avoided. The shock of this event will be carried by the crew for a long time, and you can be sure that "constant vigilance" will be my motto from now on.

At least I was fortunate in that nobody was injured and *Moonshadow* appears to have proved to be nearly bulletproof.

Moonshadow was eventually shipped from Papeete, Tahiti to Auckland, New Zealand, via freighter where the Salthouse yard repaired and ugraded her. Three years later, as we write this, George and *Moonshadow* are cruising in Fiji.

Navigation in the Age of GPS

The advent of GPS has changed much about cruising. Gone is that sense of doubt, even dread, of not knowing *exactly* where you are. The ability to constantly know your position is the most wonderful thing that has happened to voyaging, bar none.

But even with this data, mistakes are still made, as we've just seen from the *Moonshadow* story. The GPS gives a very precise position. The question then becomes, how do you use this information in the safest, most conservative manner?

Chart Accuracy

All the GPS accuracy in the world doesn't do us much good if the charts we are using are off a bit—and they are. Not all charts are inaccurate, but enough are so that you can never totally rely on your GPS-to-chart-transfer to determine your precise location.

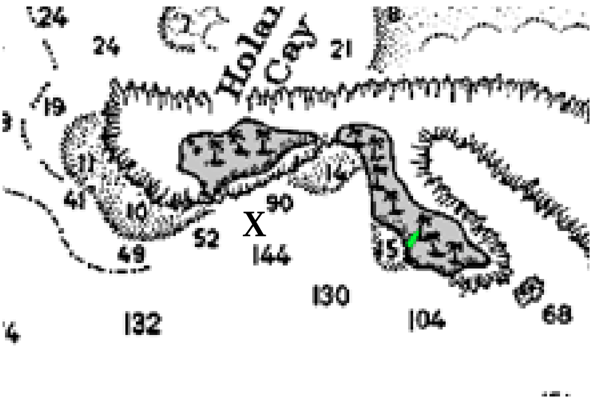
This problem is more widespread outside of major industrial countries, but to be safe, you must assume it exists everywhere, unless you can confirm from some other source that the chart is accurate.

During the winter of 2000 we took *Beowulf* from Southern California through the Panama Canal, and then through the West Indies. In the spring we ended up in New England.

In California the charts were right on the money. Our chart plotting system (which we'll discuss starting on page 274) would show us the correct side of the dock to which we were moored.

Heading down the coast of Mexico we made four brief stops. In each case the GPS position was within an eighth of a mile or so of our actual

Beowulf anchored at Holanday's Cay (left photo). Below, Beowulf was anchored on the X mark. The GPS-chart system link had us sitting on land, to the right of the 15-foot indicator east of the X. Not a big deal, unless you were trying to work your way in close at night or during a rain squall.



position—certainly close enough to get us into port, but not so accurate that we'd chance a narrow or risky entrance without radar or visual confirmation of our exact position. The same held true for Costa Rica.

Passaging through the "ditch" (Panama Canal) was amazing. The GPS had us right between the buoys all the way through, accurate to within a couple of boat lengths.

But as we started to cruise on the Caribbean side the situation deteriorated. In the San Blas Islands there seemed to be a consistent offset of an eighth- to a quarter-mile, and we heard stories of islands being several miles out of place further down the track.

By celestial or satnav standards, even these innacuracies would be considered marvelous. After all, once you got to within a few miles of your intended destination you could use your eye or radar to verify where you were. For those of us who learned to navigate before GPS, this was all second nature. But if you've been brought up thinking in terms of boat lengths of accuracy, the approach may be different.

The bottom line in all of this is to never depend totally on any single source of data, even GPS. When safety is involved, always confirm one position with a second. Whether it's from radar, visual bearings, a light house, or even a depthfinder, it's always important to use backup information.

The idyllic tropical island beach scene (above)—until you take a close look at the reef.

A few miles from where Beowulf was anchored in the San Blas Islands, on a very dark evening, the skipper of this Halberg Rassey 46 tried to use GPS to make his way through a narrow pass. He was running downwind, in 25- to 30-knots of wind, using GPS waypoints he'd been given by another cruiser. Boats anchored inside the reef tried to warn the skipper (on VHF) not to attempt the entrance at night.

He chose to trust in the GPS, rather than common sense, and it cost him his boat.

GPS safety rules:

- ❏ Always confirm the GPS position with another source.
- ❏ Plot positions frequently on paper.
- ❏ Keep a written log.
- ❏ When in doubt, slow down or heave to and wait until you've sorted out your position.
- ❏ Make sure chart and GPS datum agree.

Plotting

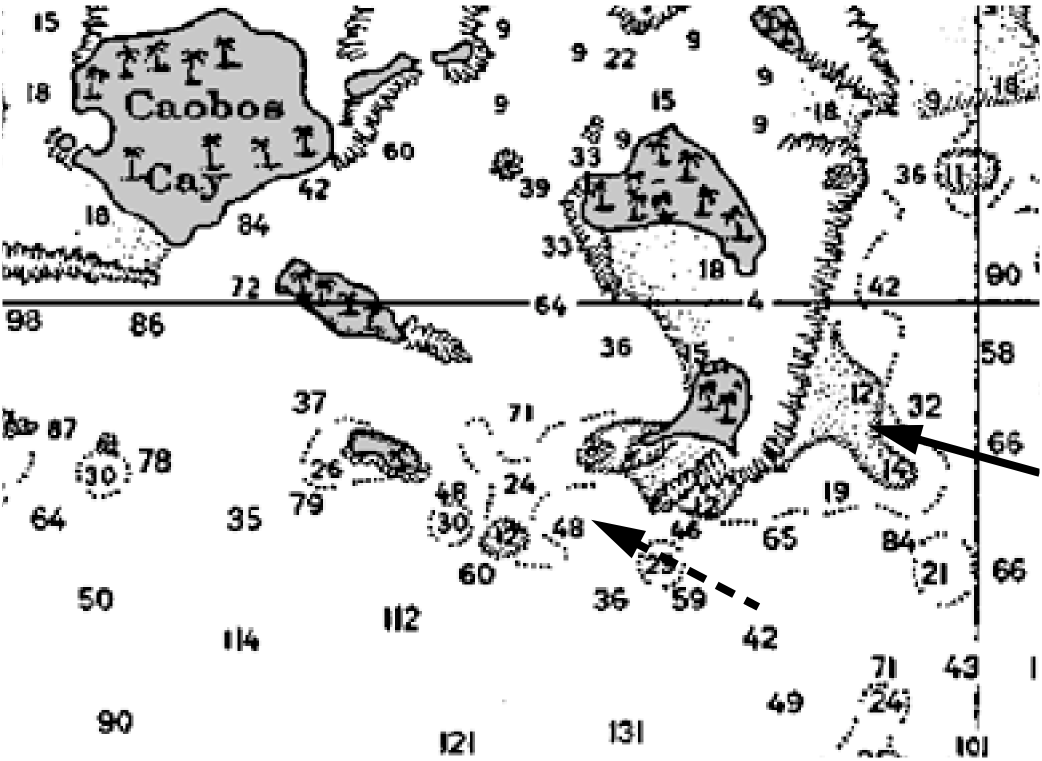
The single most important thing you can do to keep yourself out of trouble is to maintain an accurate plot of your location on a paper chart.

If this is done on a regular basis, any errors show up right away.

The time interval depends on where you are and the local navigational risks.

When we are at sea, well offshore, we make a plot once a watch (every three to four hours).

This allows us to compare our actual (GPS) position with what the dead reckoning track has us doing. The difference is current, and with that data



we can plan to make the best use (or minimize the affects) of any current in which we are sailing.

The chart above shows the area where this event took place in the San Blas Islands. The solid arrow indicates where the Halberg Rassey struck. The dashed arrow shows the pass he should have been heading for.

As we get closer to navigational obstacles we tighten the plotting schedule. Hourly is a minimum if we're worried about a landfall or reefs.

If we're making our way through a difficult area, perhaps down a long channel or through groups of islands, we'll plot as each buoy, headland, island/or other bearing is crossed.

Most of the time plotting is an unhurried, enjoyable way to pass the time on watch. It also gives you a sense of accomplishment as you see those little ticks marching across the chart. Occasionally, however, plotting is done under stress. Perhaps the weather is deteriorating and you're trying to make harbor before dark. Whatever the problem, if you've been practicing your plotting skills, when the chips are down, the situation will go much more easily.

Dead Reckoning

It is amazing how close you can come to your actual position by keeping an accurate record of course and speed. In the days of commercial sail, it was not at all unusual for a ship to sail from Cape Horn to the East Coast of the US or Europe, without a single celestial observation. But with a good DR track, and a watch alert to signs of land, they generally made safe landfalls.

Help


Vicky Carkuff

You can use a hand-bearing compass (above) for taking bearings, or sight over the top of the steering compass.

In the early 1980s we made back-to-back passages from South Africa to the West Indies. On both trips we kept two logs. One was updated by periodic celestial observations. The other was kept only with dead reckoning. The first trip we were off by 45 miles after sailing almost 6,000 miles. The next year, with a considerably faster boat, we were off by 27 miles.

The key to maintaining a good DR track is record keeping. Offshore, at the end of each hour, note the log reading and then estimate what you think was the course average. This reading is then plotted on the chart.

Try it. Make a game out of seeing how close you can come to the GPS. After awhile you will be amazed at your ability to precisely predict your position.

Lines of Position

Any time you can get a bearing on a known object and you extend a line on that bearing from the object to the boat, you have a line of position. You know that you are sitting somewhere on that LOP. If you get two LOPs to cross, you are sitting on that cross.

You can obtain LOPs visually, by sighting, or with radar. Get in the habit of using LOPs even when you don't need them. It helps with your plotting skills, and may come in handy some day if the GPS isn't working.

Current

Open ocean or tidal currents can have a huge influence on your speed and course made good. If the current is on the stern or the bow, it will affect only speed. But once it starts coming from the side, even at a small angle, it pushes you off course.

That is why the GPS course and speed made good will often vary substantially with what you are seeing from the speedometer and compass.

By understanding the reason for the current and its effect on you, you can then use it to your advantage, or mitigate the negative effects.

For the DR plot, current always needs to be factored in.

Leeway rules:

- ❑ Increase leeway allowances as the wind increases.
- ❑ Add additional leeway correction for building seas.
- ❑ A dirty bottom, poorly shaped sails, insufficient mainsail twist, and bad jib leads increase leeway.

Leeway

All boats make some leeway (slip to leeward). The less efficient your keel and rig, the more leeway. As wind and seas grow they also increase leeway. You can get a feel for leeway by tracking course made good ver-

Help

sus the compass in smooth water when sailing uphill (with no current). Use multiples of this when offshore where the sea state is affecting performance.

This is very much a trial-and-error process. As you find leeway factors that seem to work, make note of them in the log, so you'll have a written record.

It is not unusual for an average cruising boat to have a leeway angle of eight to ten degrees in protected water, and double this (or more) if they are battling hard against the elements trying to gain ground to windward.

Local nav signs vary from one country to the next. While there are standards, in some of the more primitive areas these are often not observed. The photo below was taken at Fisher's Island, New York.

Interpreting Charts

Charts contain all sorts of information, much of it in the form of symbols. This data is often printed in such small type that if your eyesight is other than perfect, you will want a lighted magnifying glass on hand.

You will find data on buoy and light characteristics, the type of sea bottom, depth (be sure to note if the depth is in feet, fathoms, or meters), and shoreside structures which can be used for positive identification.

We find it handy to keep a printed list of all standard chart symbols tucked in the back of the log book. Then, when we are reviewing a chart before we enter a given area, we make notes in the log and/or use a highlighter pen on the chart to call attention to specific obstruction buoys, etc.

Buoyage

Bear in mind that buoyage systems differ in various parts of the world. Always check well before you move to another country what sort of system they use.

PASSAGE TO AUCKLAND

The compass is still an important navigation tool.

- ❑ Be sure to use a current deviation table (to account for shipboard interference).
- ❑ Use the correct magnetic variation for your area.
- ❑ When you correct from the compass course to magnetic and then true, add easterly error (and subtract westerly).
- ❑ When going from true to magnetic to the compass, subtract easterly errors and add westerly.

As these changes are consistent (i.e. variation only changes slightly as you travel and deviation is always constant) a small cheat sheet in the log book will help you keep this straight.

On our first trip through the South Pacific the navigation aids had been so scarce and/or unreliable that we soon learned to ignore them totally. But after a few weeks in New Zealand we realized we were back in "civilization" again. We figured that if anyone would maintain their lights and buoys it would be the Kiwis.

We'd spent a pleasant six weeks in the Bay of Islands after our arrival. The kids were enrolled in the local school and we'd found a small cottage to rent. We gave *Intermezzo* a thorough cleaning, and got on with some of the more pressing maintenance tasks.

You could not ask for a more beautiful spot to ease your way back into the first world than Russel in the Bay of Islands. The lifestyle was decidedly laid back, yet everything we wanted in the way of fresh fruit and vegetables was on hand, as was a wonderful hardware store.

But after awhile the big city seemed like it might be a pleasant change, and so we were headed down the coast.

After a slow start carrying the spinnaker in a light norther the breeze had begun to build. By the time we were off Whangarei, a little less than halfway down the track it was blowing a steady 17- to 18-knots, gusting higher. Under normal circumstances *Intermezzo* would be running just fine. However, it had been three months since we'd wiped her bottom, and the cold water of the Bay of Islands had dissuaded me from getting wet. After all, we were only going a hundred or so miles, and after that we'd probably have the boat hauled to repaint the bottom.

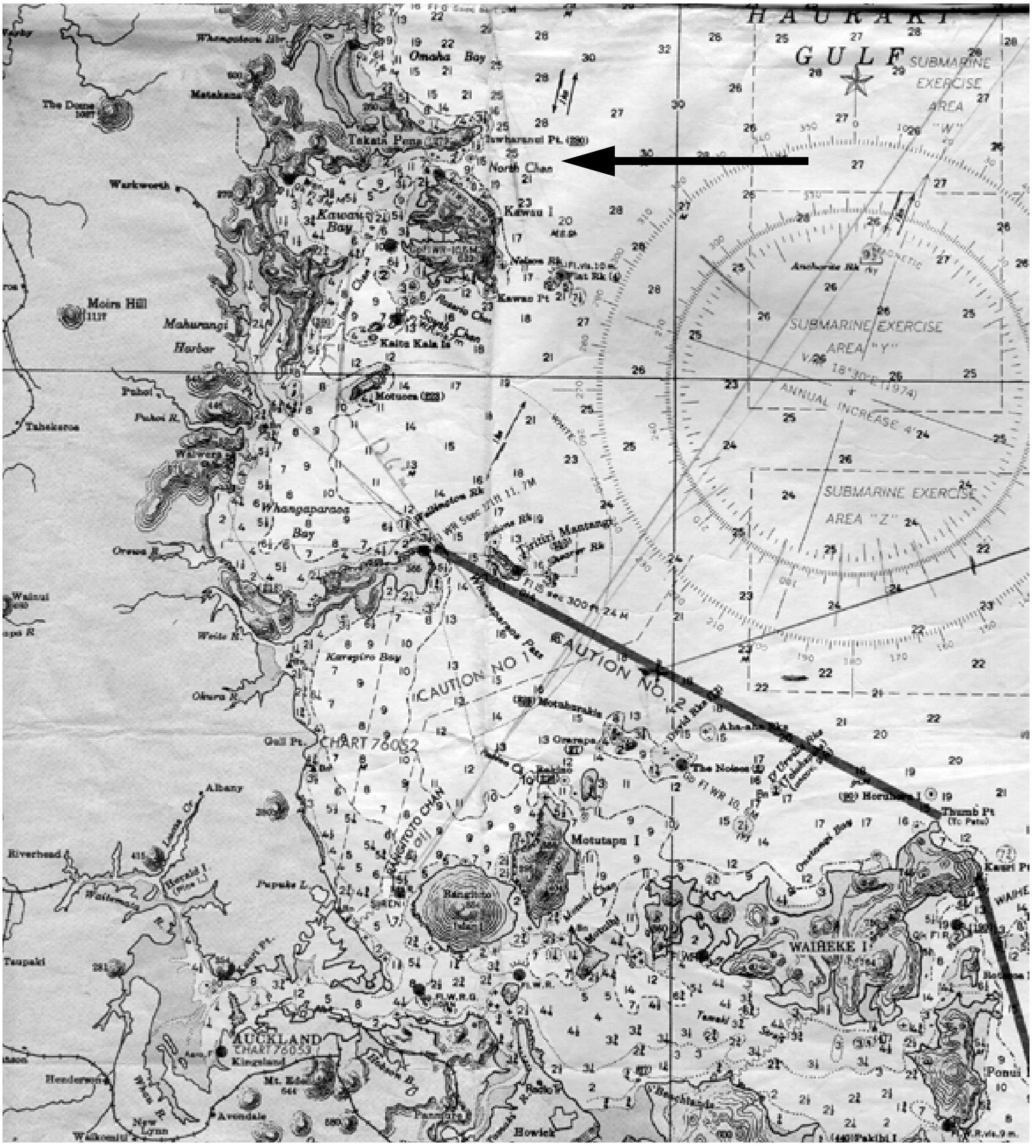
The only problem with this is that *Intermezzo* wasn't slipping along quite as quickly as we were used to, and she was not responding to the helm in a normal fashion.

The final ingredient in this situation was a flooding (incoming) tide at the mouth of the Whangarei River. It was opposing the wind at a 45-degree angle and set up a vicious chop. As we entered its influence *Intermezzo* started to roll back and forth under the chute—something she had never done before, and a minute later we heard a cry from the interior. Elyse had been tossed out of her pilot birth and onto the cabin sole still inside her sleeping bag. Fortunately she was okay, but we quickly stripped the spinnaker and set a poled-out genoa in its place.

It now appeared as if the wind was really going to build. We picked up an afternoon weather broadcast on AM radio which brought with it a gale warning for late that night. We continued to push hard but, with the foul bottom and rudder, the ride was less than comfortable and the boat quite unstable at hull speed.

Later that day, with the wind now in the high 20s to low 30s, we were approaching the entrance to the North Channel into the Hauraki Gulf. Once through the channel, we'd have our pick of spots to anchor for the night, and wait out any worsening of the weather.

Help



Approaches to the Hauraki Gulf, off Auckland, New Zealand. The black arrow at the top of the chart points to the entrance of North Channel. Auckland is on the lower left (southwest) corner.

We were well offshore, and needed to get the jib off the pole before we could jibe against the northwesterly breeze and head into sheltered waters. The decision was made to drop the jib, and then let the pole onto the deck before jibing the main. There was plenty of breeze for us to sail without headsail.

Normally this would have taken but a minute. This time, however, we were sloppy with the sheet, the boat rolled a time or two, and before we knew it, the genoa was wrapped around the headstay in an hourglass.

No big deal, except with a building breeze the hourglassed sail was shaking the rig like crazy, and we wanted to get the boat jibed.

Help

It took five frantic minutes of work changing course, pulling on sheets, and adjusting the halyard before we could get the now-damaged sail onto the foredeck. We then jibed without incident and, in a state of exhaustion and rapidly becoming very chilled, set about looking for Tawharanui Point and the entrance buoy marking Maori Rock towards the middle of the channel.

It was now dark, and we were charging towards the channel at great speed. Our normal procedure was to study the chart in detail, and then read the pilot directions before entering a channel. Just as we were about to dig out the local pilot book, we spotted the green flashing signal on top of the buoy near Maori Rock and relaxed. We knew exactly where we were and proceeded to sail rapidly towards the buoy.

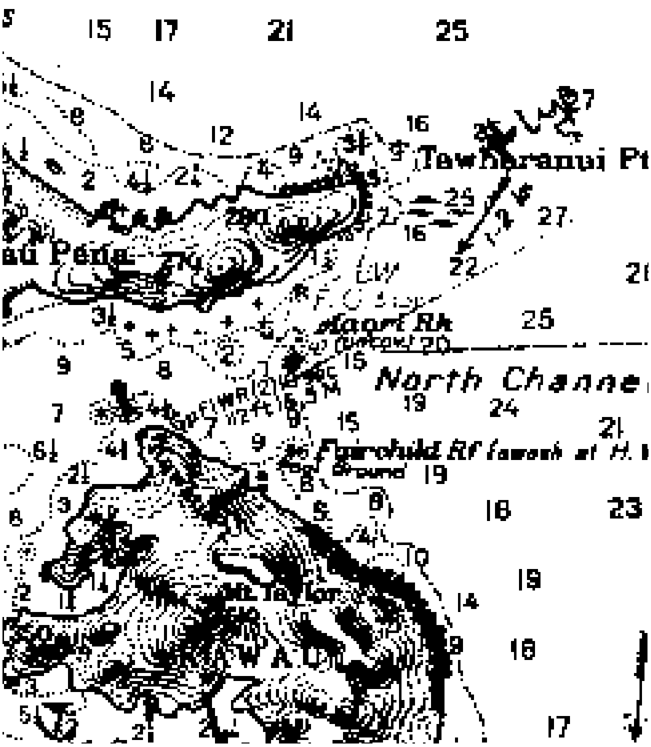
A green light meant a green or black buoy and which in turn meant to us that we should leave it to port.

Detail from a larger-scale chart showing the Norh Channel entrance and the Maori Rock light. Note the “G 5 sec.” above the “Maori Rock” indicating a green five second flashing light.

As we neared the buoy the sea began to hump up, indicating a shoaling bottom or ebbing tide. We assumed the latter, but had not actually checked the tide tables—something else we would normally have done before attempting the entrance.

The depthfinder was flashing away in the cockpit indicating a shoaling bottom, although not alarmingly.

Maori Rock buoy was now just 25 yards to leeward on our forward quarter when the sea really began to stack up with the tops breaking. We were concentrating on keeping the boat headed straight, when the depthfinder started to drop precipitously. From 25 feet, we jumped to 20, 15, then 12! The wave we’d been riding for the last ten seconds now had a full break all the way across its face, and I was loudly cussing the Kiwis for having an important entrance buoy like this out of place.



And then suddenly it was over. The depth dropped off, the sea flattened, and we were into the Gulf.

We found a spot to anchor for the night two miles further to the west and the next morning woke to a glorious New Zealand spring day.

The incident of the night before quickly faded in our

Help

memories as we explored Auckland and the surrounding bays. After a month of this it was time to take *Intermezzo* to the Salthouse Boatyard for a bottom job and some other projects. This involved heading under the Auckland Bay Bridge, and then up a long well-marked channel. The bridge carries a huge amount of traffic and, Kiwis all being sailors, a favorite pastime while driving across was to check out who was going up or down channel.

Just upriver of the bridge was the first of a series of red buoys. We recited our "red right returning" mantra and without reference to the chart immediately found ourselves hard aground on a falling tide—in full view of the thousands of Aucklanders on the bridge. Quite embarrassing.

With at least eight hours of tide ahead of us before we could expect to float off, we settled down for the wait. Linda and the kids were doing school while I decided to check the chart. You can imagine my chagrin when I noticed that shoals clearly existed all the way up the south side of the red buoys. They were marking the channel backwards!

Next I dug out the pilot book, and there, clear as can be, was the information that in this part of the world the buoyage was the exact opposite of what we were used to.

With a dawning horror I then took a close look at the chart detail showing Maori Rock. There was an exposed shoal to the north side of it. The only reason we had safely crossed it was that we'd done it on a full tide.

Hindsight

That we'd come so close to losing almost everything was a real shock, and the two of us began to reconstruct the events that led up to the unconscious decision to leave the light on the wrong side.

Foremost was the condition of the boat's bottom. This made her sluggish, hard to control, and uncomfortable. This in turn made us more tired, and slowed our progress down the coast, which increased our vulnerability to weather.

The rolling which took place as a result of the dirty bottom could have injured Elyse, and was a major contributor to the genoa wrap as we approached North Channel.

Because we were tired from the trip, then fighting the headsail wrap, and cold to boot, we were not thinking clearly. Rather than heave to, study the chart carefully, read the pilot book, and then make our entrance, we unthinkingly headed in as soon as we saw the light.

As we've seen with other people's "incidents" a seemingly minor maintenance issue—the dirty bottom—led to a series of problems which in this case could have proved fatal.

From that day on we made it a practice to never close with a coastline or enter a new harbor until we'd carefully checked and re-checked charts, guide and pilot books, and made doubly sure of our position.

Lessons learned:

- ❑ Make sure the boat is ready to go in all respects. Do not put off maintenance that could affect performance or safety.
- ❑ Always know the state of the tide before making a landfall. Write the heights and times in the log where they are easy to access.
- ❑ Study charts carefully. Note any reefs, obstructions, or shoals with highlighter pen, or with notes in the log.
- ❑ Read the local pilots or guide books, and note any dangers with a highlighter or by re-writing in the log.
- ❑ Discuss the landfall and navigation issues among the crew so everyone is aware of what to look for and what to avoid.
- ❑ Make sure of the buoyage system.
- ❑ If the sea begins to change, turn back until you are sure of the cause.

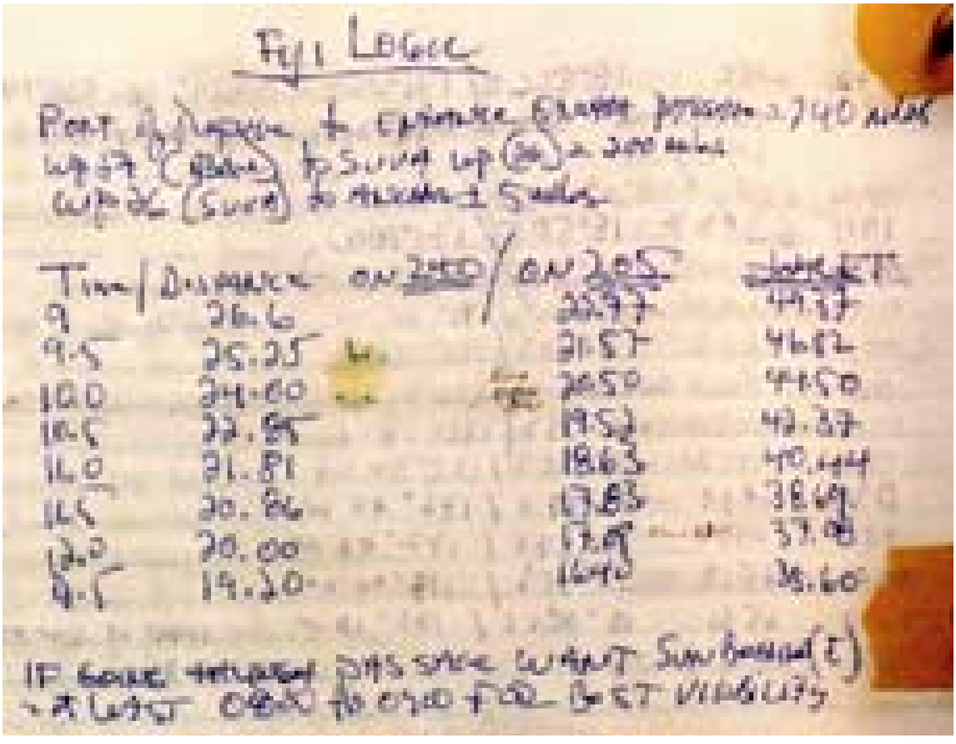
Passaging Logic

Preplanning the navigational aspects of a voyage helps you to get familiar with what lies ahead. It gives you a chance to go over the various options as you aim for the safest, most comfortable, and fastest trip.

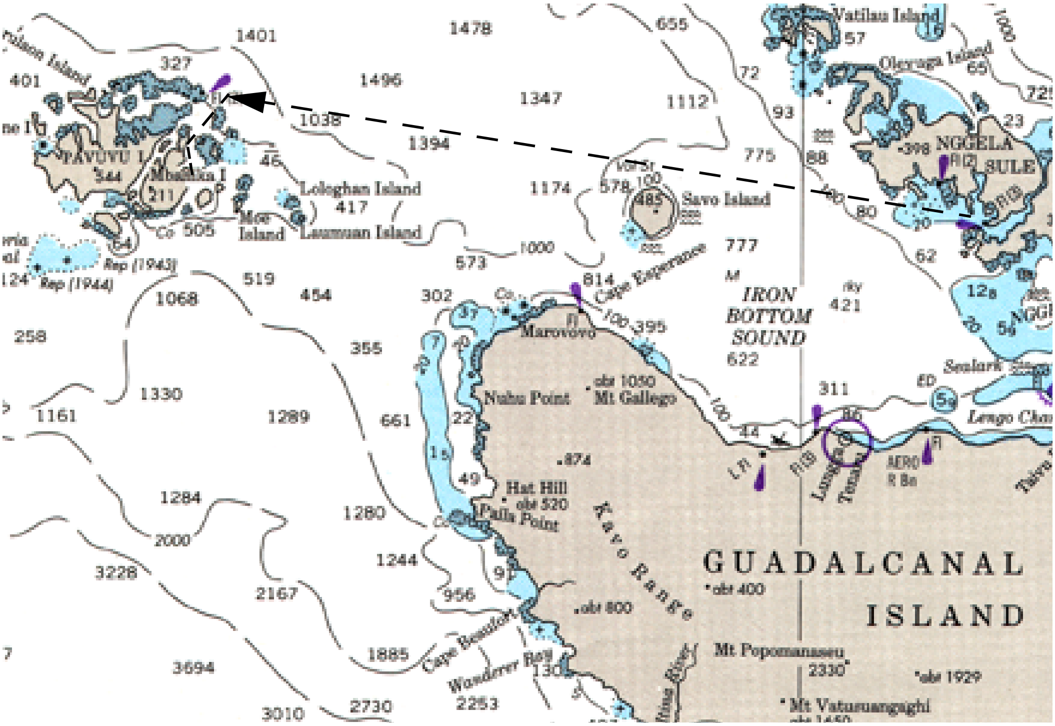
The first thing we do is carefully analyze the quality of the charts, pilots, and navigational aids on which we must rely. Then we look at the navigational hazards in each area with attention to those that will require good visibility to negotiate. We review these factors against the prevailing weather conditions, along with how quickly we expect our vessel to arrive at the projected destination.

What Speed Can You Expect?

Early in our circumnavigation we got into the habit of doing a time-versus-speed table for each leg of the projected voyage. *Intermezzo* gave us a fair amount of speed, even in lighter airs, and by varying our projected speed between 5 1/2 and 7 1/2 knots we could figure out our options for arriving at the next destination within the proper time limit. Our usable speeds have gradually climbed over the years to where we now count on 11 to 12 knots with *Beowulf*. The increased speed brings with it the ability to get passages over more quickly, but the approach doesn't change.



A page from the log book on Beowulf from our trip down to New Zealand. This deals with the passage between Vavau, Tonga and Suva, Fiji, a distance of 445 miles. The far right column is the elapsed time to Suva. The column next to it is an intermediate waypoint about which we'll be jibing.



Towards Ndina

As an example, take our trip from Sand Fly Passage in the Florida group of the Solomon Islands to Ndina in the Russell group, a distance of 51 miles.

The route through Sand Fly Passage had many outcroppings of reef to be avoided, along with numerous currents and whirlpools. A reasonably high sun angle was required for safe eyeball navigation.

On the other end, we had to thread through a series of islands. Since the sun was north of us and the approach to Ndina would be towards the southwest, a late afternoon arrival would be okay, as the sun would be over our shoulders by then going into the pass. (For more information on eyeball navigation and sun angles see page **312**.)

With the spotty tradewinds encountered at that point, we didn't feel we could count on more than 5 1/2 knots of boat speed. As a result we would need to allocate a little over nine hours, at worst, for the trip. Allowing for a 1700 arrival in Ndina, we could leave Sand Fly Passage as late as 1000; since we could see well by 0900, we were all right.

Moonlight

There's a strange rumor concerning a cult of seagoing moon worshippers in the tropical cruising areas. Entire anchorages become restless on the approach of a full moon. Tension rises perceptibly in these yacht-filled anchorages, and then, as the full moon appears, the yachts vanish.

While not many people cruise in Melanesia, and the navigation is challenging to say the least, it is a fascinating area. Every village has a unique culture, and often a different language.

And the same problems we faced almost 20 years ago between Sand Fly Passage and the Russels exist today, even though GPS is there to assist. At each end of the trip, among the reefs, it is still necessary to have good visibility for eyeball navigation—which means leaving and arriving with the correct sun angle.

Notice how when we leave Florida (Nggela on the chart) we are heading west, so the a.m. sun is behind us. In the afternoon, with the sun in the northwest as we headed southwest into the pass, we were still okay with the sun angle.

In the olden days (pre-GPS), we used the moon both for LOPs and to light up the horizon so that we could shoot the stars and planets during the evening.

Today we theoretically know where we are at all times. However, the moon still provides visibility with which to look for obstructions, spot reefs which are misplaced on the charts, and enjoy a good view of the rig and sails.

Celestial Preplanning: If you'll be using a sextant, a little pre-planning in the celestial area is also a help.

Figure out in advance the declinations of the heavenly bodies you intend to use. If the sun is close to your declination (latitude) for example, you'll get great longitude LOPs all day long, but you'll be hurting for accurate latitude.

Tidal States

It goes without saying that when there's a danger of grounding, or when approaching a partially submerged reef, the ups and downs of local tides must be noted in advance.

In some places it's crucial to know the moon cycle and its relationship to tide and current. Darwin, in northern Australia, is one such area. With 24-foot (7.5-meter) tides and commensurate currents, weaving your way into that port for the first time during spring tides is to be avoided.

Underwater Features

Another way to avoid trouble by preplanning is to look at the deep- sea charts for underwater ridges or mountains, especially in areas of substantial current.

South of Madagascar, in the southwestern Indian Ocean, the water goes from thousands to a couple of hundred fathoms in a few miles. This, coupled with strong currents, occasionally produces incredible seas, even in modest weather.

Landfall Considerations

We also like to have a good look at the topographic features of landfalls we expect to make on a passage. If there are mountains with extensive valleys between them, the landfall will first appear as a couple of small islands. If there are some real islands in the area, you may have trouble sorting things out before you get close enough to discern the low ground between the mountain peaks.

The last thing we do when planning a difficult landfall is to make a list of all the negative things that could happen, and then determine the best reactions that would minimize risk and discomfort.

Poor visibility tops this list. Then comes unexpected current, whether favorable or adverse. Finally we look at boat speed beyond the normal upper and lower range that we usually maintain.

If the wind gets really light, do we fire up the engine or slow down and wait for the following day? If we're moving too fast, at what point do we slow down or heave to?

Close attention to all these factors before leaving on a passage will make landfall a lot more comfortable.

NAVIGATION AIDS

"Caution! The whole of the area on this chart is as yet very imperfectly examined and charted. Mariners are cautioned accordingly."

This comment could apply to most of the tropical Pacific Basin and Indian Ocean, the shores of the Red Sea, the east coast of Panama and many other excellent cruising grounds. The warning might also be amended to include most of the sailing directions used by cruisers, as well as lists of lights and other government publications.

In short, once you leave the "civilized" world for the best cruising country, you are left more and more to your own devices for accurate piloting and navigation.

"What about GPS?" you are probably wondering.

GPS is a wonderful tool, but once this position data is in hand, what good does it do if reefs and islands are mischarted, and undersea volcanoes have grown up since the last chart edition?

Rules for Defensive Navigation

After our own wanderings in some of the worst navigational areas to be found, we have learned the hard way several rules to keep in mind.

The first and most important is, as we've been saying, to stay alert. Unless you are well away from any land/or known dangers—and to us that means at least 100 miles with celestial positioning and 30 miles with GPS—always have someone on deck maintaining a lookout.

As already mentioned, the printed aids we have to work with leave much to be desired. The best solution we've found is to radio or e-mail ahead to fellow cruisers to ask what they have found.

Frequently it's possible to obtain a light list or almanac from the country you're about to visit. This will tend to be more up to date than an all-encompassing tome from the UK, US or France. Nevertheless, even these are sometimes inaccurate.

I remember going to the Marine Office in Honiara, the capital of the Solomon Islands, for the latest navigation data. We were shown an impressive bulletin board on which were listed the current locations, characteristics, and maintenance status of all lights and beacons in the Solomons. We later found that about 50-percent of the time what we saw did not agree with the bulletin board.

Pilotage Data

Pilot books, mostly written for big ships, often give too much of the wrong type of data. Frequently the warning material in them does not apply to cruisers.

Having used both the US pilots and British Admiralty pilots, we have found the latter to be a bit more accurate relative to our needs. But the data presented must always be taken with a grain of salt, and updated with local knowledge.

One excellent source of current data, written with the cruiser in mind, by other cruisers, are the Seven Seas Cruising Association (SSCA) monthly bulletins.

Charts should be used with caution as well. Whenever piloting in difficult areas, we refer to our detailed charts, but we never rely on them.

So, what do you do about an intriguing destination that hasn't been surveyed for the last hundred years? The answer is to avoid those passages where the data could be in doubt—generally in the poorly charted tropical areas—unless you have good eyeball conditions and need the chart only as a general reference.

When cruising offshore in low-traffic areas, be particularly careful. It's not unusual at all to see notations on charts about islands that have been reported to be five or six miles from where they're charted, or reefs that have extended a couple of miles farther offshore.

Backing Up Electronics

With the growth in availability of electronic position-finding gear in the last decade, shipboard navigation has changed completely. From an era when most sailors trusted to their taffrail log or knotmeter and distance tables in conjunction with a well-honed sea sense, many sailors today are willing to let the GPS talk directly with the autopilot while they read a book and take an occasional look around the horizon.

For the most part, one can get away with this *laissez-faire* form of navigation. Today's equipment is reliable and generally easy to operate, reducing the chances for operator error.

But caution still must be exercised. Depending totally upon the reliability of any individual piece of navigation equipment is a prescription for an eventual call on one's insurance agent.

Besides, navigation is one of the most interesting phases of seamanship, and letting a black box take over removes some of the thrill of a well-made landfall.

We are by nature "nervous navigators." While we have used various electronic navigation aids, our first preference has always been direct observation and/or the sextant.

Now that we have GPS, the sextant seems to spend most of the time sleeping in its lovely timber box. However, we are always more comfortable once we have confirmed the GPS position plot with another form of position finding (visual sighting, radar, or a second GPS position also plotted).

When making landfalls under poor visibility, a set of go/no-go criteria are established. These take into account the reliability of our navigation aids, the relative risks of making a mistake, and the problems of standing offshore until visibility improves.

Radar Navigation

Radar is a wonderful navigation tool. It allows you to confirm the position you establish with GPS, celestial, or dead reckoning. It helps with weather warnings and to a degree, with watchkeeping.

But unlike a GPS, which gives you an absolute answer, the radar image needs interpretation by the operator, and a whole series of issues can arise to obscure the true meaning of what you see on the radar screen.

So, this marvelous tool is a two-edged sword. When conditions are good, and the radar is working properly, it is the experienced sailor's first choice for position fixing. But when used improperly, radar can lead to a false sense of security, which can lead to dangerous situations.

The key with radar, as with any other piece of navigation gear, is to always back up your initial radar-based assumptions with another position fix. This could be a visual observation, perhaps the depthsounder, GPS or a series of bearings taken off the radar screen itself.

Radar operator's check list:

- ❑ Always make sure you can see return from waves or other targets to confirm the set is properly tuned.
- ❑ Periodically adjust range up and down to check for close-in targets which may not be visible at longer ranges (and vice versa).
- ❑ Use sea clutter and rain clutter controls with care. They may obscure hard targets which you want to see.
- ❑ Never totally depend on radar. Make a periodic sweep of the horizon on deck. You will often see things with your eyes that the radar misses.

Factors Affecting Radar Image Quality

A series of factors affect how well your radar can "see". First is the physical size of the radar antenna. Bigger is exponentially better. Larger antennas are able to disciminate, in other words tell the difference between, targets more precisely. This becomes especially important when there is lots of traffic, buoys, or waves.

Next comes the quality of the circuit design. Some radars seem to have inherently better ability to interpret their signals. If you want to know what is the best radar, find out what the commercial fishermen are using. Their livelihood and safety depend on this gear.

The height of the radar antenna off the water cuts two ways. The higher the antenna is the further it can see. However, the targets you are most concerned with, land and shipping, are already quite high. On the other hand, the higher the antenna the more sea-clutter (return from waves) is a problem.

We typically mount our radars about 15 feet (4.5 meters) above sea level. This is high enough to pick up the palm trees on an atoll at 24 miles using our 42-inch (1.1-meter) open array antenna Furuno radar.

You also need to consider the power of the radar, although this is not as critical as the factors previously discussed. Power is important in two contexts. First, in conjunction with a large antenna, it helps to paint small targets and differentiate them from other images. Second, it is helpful at longer range.

External Factors

Sea clutter (the radar return from waves) we've already alluded to. When you are hunting for small targets like yachts or nav buoys, even a moderate sea—something in the three-foot (0.9-meter) range can cause problems close in. Offshore, bigger seas may block out all but the largest images within a three- to four- mile range around the boat.

Likewise, rain can mask targets, sometimes even those further away.

Other issues with radar return are the shape of the target, its density, and if it is moving or still.

The ideal radar target is a metal structure with hard angles. The worst situation is soft material with a rounded shape.

Building Your Skill Level

Like many of the subjects we've been discussing in this book, the skill of a radar operator is proportional to his or her experience. The more time you spend working with your set, learning its weak and strong points, the better you will be able to interpret the screen when conditions are difficult. In the rest of this chapter we will be giving you some hints about things to learn about your radar set. The key is to go out and practice. Look at the radar, and then look around. After a while you will begin to be able to pick out small targets in sea clutter, tell the difference between a small yacht and commercial fishing boat, and judge the density of a weather front or squall by the rain bands associated therewith.

Tuning and "Gain"

Most modern radars have an automatic tuning function, whereby they adjust certain characteristics based on the range at which the radar is set. Beyond this, there is usually a gain adjustment. Increasing gain increases apparent signal strength.

If the gain is set too low, targets are lost. If it is set too

These images, and all that follow are from the model 1941 radar aboard Beowulf. This is a five-year-old model with a 42-inch (1.1-meter) open-array antenna, putting out four kw of power.

In the top photo electronic target enhancement is turned on and gain is too high. The heavy arc on the one mile (second) ring, where we've got the white arrow pointing, is excess return from a tug and tow.

The middle photo has the gain turned down, but electronic target enhancement is still on. Note how the tug and tow are almost merged into one target. In fact this radar return goes back and forth between what appears as a single or double target. To the right of the center of the screen are a series of smaller targets. These are fishing buoys.

The bottom photo has no electronic enhancement. The tug and tow are now two clear targets and we've lost the fishing buoys. There are rarely any general settings which work well for all situations, which is why it makes sense to be continually fiddling with gain, target enhancement and other controls.

Help

high, targets which are close together will blend together and seaclutter will be enhanced.

Having gain set too low, so that the smaller targets simply do not show up, is a common problem. Obviously, if you are counting on your radar to find these and are operating on the assumption that the radar is operating correctly, this can lead to difficulties.

However, there is a simple answer: periodically adjust gain upwards, until you start getting excessive sea clutter. If the radar is picking up sea clutter this tells you it is working. Then you can back off on the gain a hair to where sea clutter is not as big a problem, leaving enough of it present on the screen to let you know the set is properly tuned.

Electronic Target Enhancement

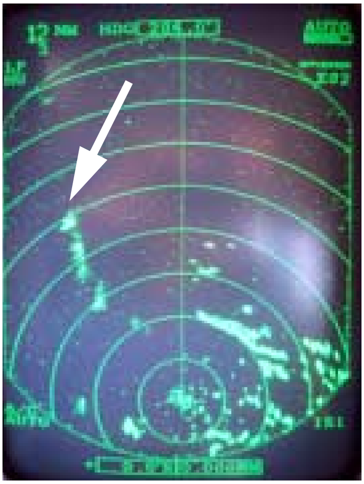
Modern radars typically come equipped with some form of electronic target enhancement. When you are offshore, and sea clutter is not an issue, this can be a real help in finding smaller targets.

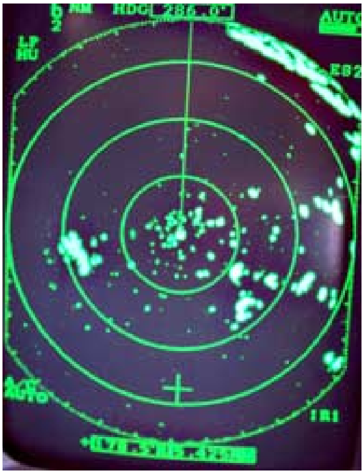
We have found that most of the time we are offshore the target enhancement is turned on. However, when we start looking for smaller targets closer in to us, and sea clutter is a problem we turn it off. Likewise, in areas with lots of targets, either navigational, other vessels, or land masses, we typically leave it off.

And sometimes we switch back and forth, using it for a minute or two, and then turning it off for a while.

Range

The range at which the radar is set is another factor with which we do a lot of fiddling. If we are watching for ships offshore we'll typically set the radar at 16 miles. When we are looking for weather, we jump between 24 and 48 miles.





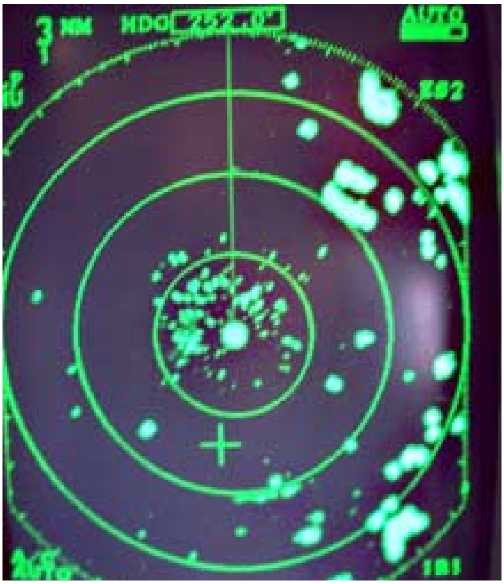
Range and the ability to offset the screen go hand in hand. n the top photo we are on the 12-mile range and the screen is offset all the way to the bottom. This allows us to see 24 miles ahead but with targets enlarged as they would be at the 12-mile range. Visibility aft and abeam is reduced in this mode. Note the headland just to starboard of dead ahead, and then compare it to the rain band (white arrow) off to port. Aside from the fact we know from charts there is no land where the rain band shows up, this target is soft and diffused, which is typical of rain images.

In the middle photo the radar is still offset, but range has been dropped to six miles. The headland is now much more pronounced, but the rain band is out of our viewing area.

The bottom image is still on six mile range, but the image has been centered. The island 3.7 miles off the port beam is now clearly visible.

Help

Both of these images have electronic target enhancement turned on (which aggravates sea clutter). Winds are about 10 to 12 knots, and there's a small sea running, perhaps two feet (0.6 meter). It would be very difficult to pick out a target close to the boat in this situation. In the image below the automatic sea clutter control has been turned on. Notice how the targets close in have been reduced. This will help you to pick out the stronger targets but will hide those which are weaker. By studying the sea clutter carefully, over time it is possible to pick out the "hard" targets. These tend to repeat themselves against the more random appearance of the waves.



As we close with shore, or when we're in traffic the range will be progressively tightened, sometimes to just a mile or two (or even less going into a harbor).

At other times we'll jump between a short range, perhaps two or three miles, looking for close-in traffic, and then back out to a longer navigational range.

What we are trying to say is that it often is best to switch back and forth. This gives you the best chance of finding the difficult targets.

Adjusting for Sea Clutter

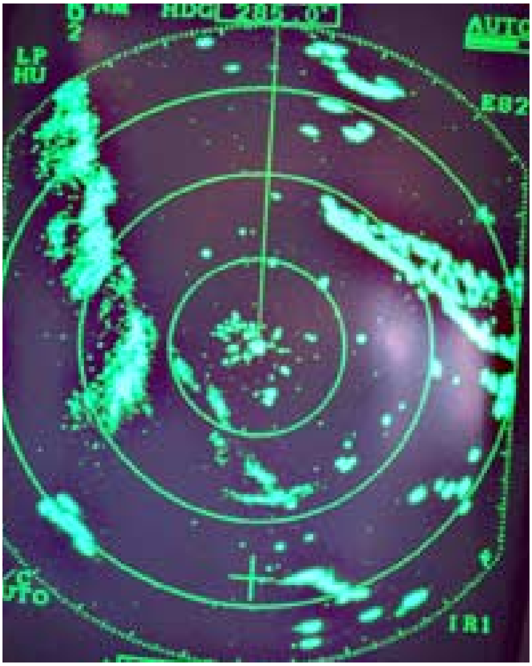
As we have already mentioned, sea clutter is one of the biggest challenges to interpretation. The bigger the sea, the more problem. We've been in situation where 100-foot (30-meter) steel fishing vessels were lost in the sea clutter four miles out. And it is quite common to lose smaller vessels in a small sea at the one-mile range.

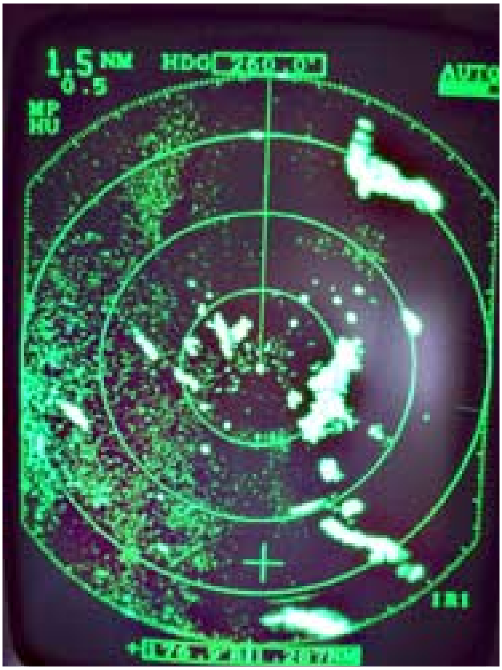
On the other hand, with good quality sets, and a practiced eye, you can often pick out the hard targets from sea clutter. That target may not be there all of the time, but it will be present from time to time, usually in the same place, and if you are careful, you can distinguish from the more random return from the waves.

All modern radars have internal circuitry designed to suppress sea clutter. In some conditions this helps. But the risk is that while suppressing sea clutter the smaller targets of boats or buoys are also suppressed. As a result, we rarely use our set's automatic sea clutter capability. Note that by turning down the gain control you can also reduce sea clutter.

The best way to get used to interpreting sea clutter is by experimenting. Any time the waves start to build up, try looking for small targets. Adjust the gain and sea clutter controls and see which gives you the best image of the target you know is there.

Help





The left photo shows the rain band closing in on us which we first saw developing two pages ago. Note how dense the showers are in the middle of the rain band. The rain in this case will mask all but the strongest targets—sometimes even big ships. Turning on the rain suppression controls may help, but this control also reduces return from hard targets.

The right photo shows lighter rain. The radar can typically see medium to strong targets through lighter rain. Note that it helps to reduce gain and turn off electronic target enhancement with rain about.

Rain Suppression

Heavy rain will obscure most objects. But medium to light showers will usually let you see through them. Often just adjusting the gain down will help. There will also likely be a rain suppression feature. Some of these work reasonably well. But to be safe, it is best to assume the rain is masking a target and proceed accordingly.

Note that even though the rain obscures targets, if you go on deck and look around you are normally able to see with your eyes in conditions in which the radar will be totally obscured.

Interference Rejection

When there are other radars operating in your area they will often create interference patterns on the radar screen. Sometimes these look like pinwheels. At others they are sporadic lines.

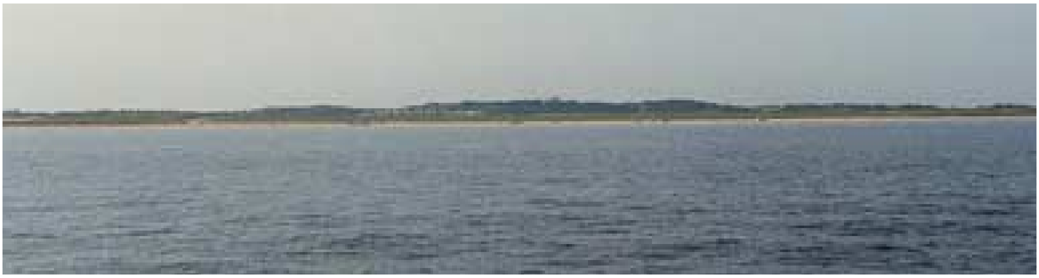
Many radars have an automatic interference rejection capability. The one on our Furuno works quite well.

Side Lobes

When there are big, hard-edged targets nearby, like ships, they will often create a series of images. This is the result of too many targets coming back at once for the radar to process. You end up with a huge target on the screen which becomes difficult or impossible to interpret.

If electronic target enhancement is on, turning it off will help. Also, turning down the gain setting will help reduce the problem.

Help



The top photo is of the northeast side of Cape Cod, on the East Coast of the US. The beach is low and gently sloping. Behind it are steep hills. The radar has the automatic target enhancement turned on, and gain set high so that the beach shows up clearly in the lower photo (it is the left of the two heavy vertical lines. The hills can be seen as the second line to the right.

Radars with smaller antennas and/or lower power might not show the beach at all, leaving just the hills behind. If this were your only source of positioning data, that could lead to trouble!

Interpreting Topography

We started out talking about the shape of the targets and their radar returns, and we want to come back to this for a moment.

Where you have a gently sloping shoreline, backed by a steep cliff or mountain, the radar will often show the steep inland feature well before the foreshore.

This can be confusing to say the least, and it can lead the unwary to think they've got plenty of room when in reality the shoreline is substantially closer than it appears on the radar.

The only way to know that this risk exists is by studying the topography of the land mass in question on the charts or local pilot books.

Turning Radar On and Off

Modern radars employ sophisticated computers to help process their signals. On occasion, they seem to lock up and lose the ability to do their job effectively. We've had this happen with a number of different types of radars over the years. And we've found that something as simple as turning the set off, and then on again, typically clears up the problem.

Don't Forget To Look On Deck!

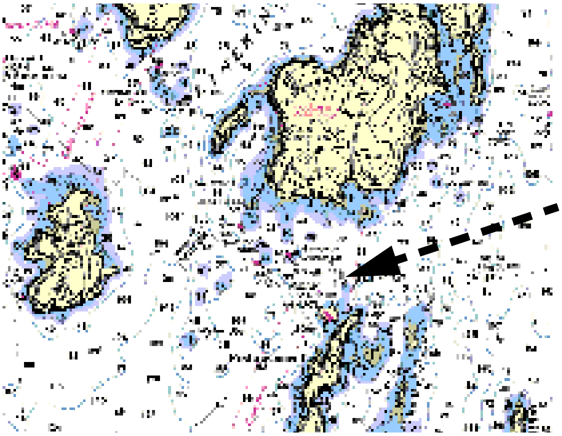
As we were finishing up this book during the summer of 2000 we were cruising in New England and Maine. The weather was, well, awful. Cold, rainy, and of course foggy. We spent a lot of time using our radar, and testing various electronic charting systems (for the next chapter).

One day in particular stands out. We left Camden, Maine, in good visibility, heading for Boothbay. We were in the process of using our fourth electronic charting system, and had laid out a course, buoy to buoy, through the tortuous channels, rocks, and reefs which abound in this part of the world.

It wasn't long before we were down to a half a boat length in visibility as heavy fog closed in. We reduced speed accordingly, watched the radar, and kept an eye on the electronic charting system.

Both of us were in the pilot house. One was looking forward, the other darting eyes between radar and laptop computer

Help



The dashed arrow on the chart (upper left) indicates our course and points to where we almost hit the powerboat. The radar image shows the same area. Note the rain clutter coming from the port side. The radar photo was taken five minutes before we came up on the powerboat.

screen. We were thinking how marvelous all of these electronics tools were, as we glided along, 100-percent certain of our position.

And then ahead of us was the stern of a 32-foot (9.8-meter) powerboat. They were stopped dead in the water, a boat-length from a bell buoy, probably trying to get their bearings. The powerboat target and bell buoy image had merged, and we had almost run them down. A quick application of full reverse (*Beowulf* has engine controls in the pilot house) and our bow stopped less than 20-feet (6-meters) from the other boat's stern. Had we hit them they would have gone to the bottom in seconds.

We backed up, turned right, and moved around them. We could see the couple in their pilothouse looking forward. They never even knew we were there, which is a good reminder that with all the electronics available today, nothing supplants a careful watch on deck!

Look carefully at the bottom photo and you will just see the outline of the stern of the powerboat. This photo was taken after we'd reversed and had started to move past them.

Help

Electronic Charting

About ten years ago we started receiving complimentary copies of charting programs to evaluate. At first the concept sounded intriguing, but after spending quite a few hours trying to master the early programs we gave up. They were too slow, and way too complex to suit our style of cruising. But things change.

In the fall of 1999 as we were working towards finishing this book we were also getting *Beowulf* ready to take to the Caribbean. We had received a number of e-mails during the preceding year asking us about the latest charting systems. But we had all the paper charts we needed already, and with so much on our plate were not keen on having to buy a new computer, connect it to a GPS, and learn to use one or more programs.

A month before we were ready to head out we were chatting with ocean racing navigator Stan Honey about several things. At the end of this conversation we inquired as to Stan's feelings on the subject. His reply "using electronic charts is like the first time you used a sat nav or GPS after doing celestial. Once you start you will never go back."

That was enough to whet out appetite and in short order we had a series of complimentary copies of charting systems from all the major players.

What follows is based on using these different systems on our passage down the west coast of California and Central America, thence through the Panama Canal and through the Caribbean, with a final leg to the east coast. Our verdict? Stan Honey is right. We are hooked!

Why Use Electronic Charting?

There are two major reasons for using electronic charting. One, once you are comfortable using the software it does substantially reduce the navigational work load.

While this in itself is not usually an issue, in times of stress, due to a crewmember being sick, or perhaps threatening weather, the lowered work loads can add to your safety.

The second reason is based on selective availability having been turned off in the GPS system. With GPS positions now repeatable in the 50- to 100-foot (15- to 30-meter) range, by making a track of your course into an anchorage or through a pass, you can always retrace your steps, confident that in spite of any chart inaccuracies, if you made it in, you can make it back out (assuming of course that the state of the tide doesn't interfere).

In an emergency, these two factors, the ability to back track and the lower work load, can really be a help.

Years ago we were cruising in British Columbia aboard *Sundeer*. Steve's dad, Stan, was with us on his boat *Deerfoot II*. Late one evening, just as we were getting into bed we got a call from *Deerfoot II* saying Stan had been taken seriously ill and we needed to get him to a hospital as quickly as possible.

The nearest facilities were at a small logging town, Campbell River, about 40 miles south of our position. We transferred Stan to *Sundeer*, picked up the hook, and headed south at full speed.

Yachts avoid running at night in this part of the world at night due to the logging debris in the water, numerous shoals and reefs, and substantial commercial traffic, but we had no choice. When we are piloting in difficult areas our system is to have one of us on deck keeping watch while the other navigates below, and operates the radar.

In this case, Linda was below keeping Stan comfortable, so both navigation and watchkeeping was left to Steve, working on his own. Three hours after leaving our anchorage we were met by a patrol boat with medics aboard, and we transferred Stan aboard for the faster ride to the hospital. Things turned out fine medically, and a decade later Stan is still going strong. However, the trip itself could have turned into a disaster. If Steve had made a single mistake, *Sundeer* would have ended up on one of the many reefs in the area. A charting system would have been worth its weight in gold during this short passage.

Do you need paper charts?

- ❑ If your safety depends on charts it is simply not prudent to totally rely on a computer-based system.
- ❑ Even with a backup computer, loaded with software and ready to go, an electrical failure or lightning strike could wipe out everything.
- ❑ At a minimum, carry area-wide paper charts. Then, print out from the computer paper versions of the detailed charts of where you are heading towards.
- ❑ If this approach makes sense to you, consider an inkjet printer capable of using 11- by 17-inch paper.

Navigational Skills

Before we go further we'd like to offer one caveat. These systems work so well that we are seeing a lot of people using them as they are just starting out. The capabilities of the electronic charting system are being substituted for learning the basics of piloting.

This is a serious mistake. These systems are not 100-percent reliable, and when they fail, it is usually when you are closing with shore. Understanding basic pilotage, and mastering it on paper, will make your experience with the electronic charting system much better. This also helps to develop your sea sense, which is what will give you an alarm when something is going wrong with the navigational systems.

Dedicated Plotter or Laptop Computer?

At this stage it appears to us that the laptop computer is the way to go. It is less costly in the long run, and offers a much greater potential viewing area than dedicated plotters. In addition, you have the ability to change charting software and use a variety of charts. With a dedicated plotter you are locked into both charts and software.

Hardware Issues

Things move so fast that anything we write on this subject will be obsolete by the time this book is printed. On *Beowulf* we have used a Gateway "Solo" laptop, with a 14-inch screen. This has a 433 mgHz processor, 64mb of ram, and a 12mb hard disk.

Although we were told that speed is not an issue, after using these systems for the past year we feel that faster is better. The more memory you have, and the faster the processor, the faster you can move between charts, change scale, and update the existing display.

Computer buying check list:

- ❑ Go for the biggest screen size you can fit and/or afford.
- ❑ Processor speed is more important with some software than others. 400mHz is a minimum.
- ❑ Get at least 64mb of random access memory.
- ❑ A six-mb hard drive is a minimum. 12mb is a lot better.
- ❑ Verify how the screen dimming system works.
- ❑ Get the most stable operating system available, that you are qualified to use.
- ❑ Make sure there is an electronically quiet 12-volt power source available for the computer.

Software purchase check list:

- ❑ Does the system work with a variety of charts?
- ❑ Are there charts readily available for everywhere you want to cruise?
- ❑ How fast can you pan, zoom, and change charts?
- ❑ Are multiple chart windows easy to use?
- ❑ What sort of centering options are there for keeping the boat in a given part of the computer screen as you move down your course?
- ❑ Is magnetic variation automatically updated from chart datum or the GPS?
- ❑ How easy to use are the tide and current tables?
- ❑ What sort of night lighting controls are available?
- ❑ Are the tools for laying out and editing courses intuitive?

A final word on computers. Check out the ability to manipulate screen intensity levels. As day turns to dusk, and then night, you will want to dim the screen. How this is accomplished, and the amount of dimming, varies widely between machines.

Charts

Before we talk about software issues a word is in order on chart formats. There are two approaches. Raster charts are simple scans of paper charts, usually official government publications.

Because there is so much data in the scanned area, the computerized chart files are quite large. This slows down the speed at which you can pan around the screen, or move from chart to chart. On the plus side, you are getting the official chart with all that this implies from a quality standpoint.

The other way to go is to digitize the government charts into what is called a vector format. In this case a computer operator, using a hand operated mouse, literally traces and/or records the pertinent data. The advantage is that this data is on layers which you can turn on or off, and is easily updated. These charts are far more compact in terms of computer memory, so they load faster and zoom and pan is quicker. There is one major problem with vector charts: the potential for mistakes exists in the transfer process. The private companies doing the manual digitizing simply do not have the budget to check the final product as closely as do the government hydrographic offices. Whether or not this is an issue is yet to be decided.

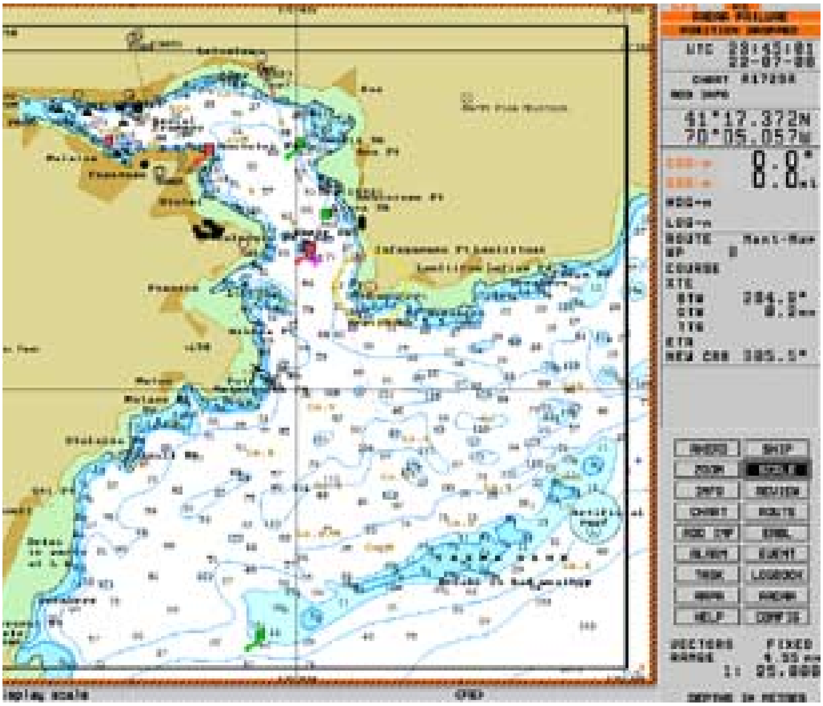
There are many different companies producing vector and raster scan charts. Nobody (yet) covers the entire world. Many of the better cruising locations, those wonderful out-of-the-way areas, do not have detailed charts available. In other areas one company may have coverage while another does not.

If you are looking to use your charting program in popular areas, with lots of traffic, almost any system will work. But for serious cruising look for a software program which uses the largest variety of charts.

Operating System

We hesitate to get into the subject of operating system as this changes so rapidly. Basically, unless you are computer savvy (we are not) you want an operating system which is easy to use. As this is written the defacto standard is Windows 98. However, this is significantly less stable than Windows NT. In other words, Windows 98 will lock up and/or crash more often than NT. However, NT is far more difficult for the lay-person to connect peripheral devices to.

One issue with system stability is what else is running. The ideal situation is a laptop which only runs the charting software, without extraneous hardware attached. Since this is often not practical (most people want to



A vector-based chart from Transas. These are now available on the latest Nobletec software. With the Transas software, which is primarily designed for use aboard ships, you cannot easily change the control panel on the right side of the chart.

use the computer for e-mail, word processing, etc.) the next best step is to leave off other programs when the charting system is in use.

Software Features

One of the problems with choosing the best software for your needs is having a feel for what features are important. Until you have lived with a couple of different programs it is hard to know what to look for. Listed below are the features which we find most important.

First, as already discussed, is the ability to use a variety of different chart formats. Some programs lay these out for you in a hierarchical format: official government charts followed by non-official charts.

Next is the ease and speed of loading charts, changing zoom levels, and panning. This seems to vary widely between software.

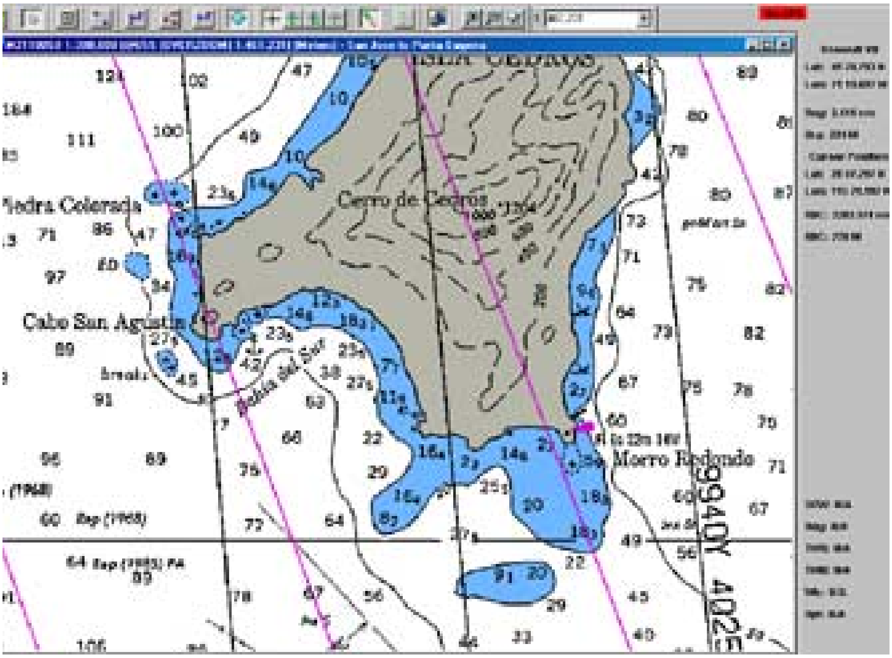
The way multiple windows are laid out is next (and of course the speed of switching between them).Often we have two scales of chart open (a wide area and then detail of the spot we are traversing).

All programs have features which move the chart automatically as the boat moves. However, how this is accomplished varies. The best system is one which allows you to easily choose the area in which the boat stays. If you are headed east to west you would probably want the boat towards the east edge. South to north course favors a bottom location for the boat symbol.

Magnetic variation is typically automatically set, usually with data from the GPS. This feature needs to be easy to operate and clear as to whether true or magnetic is being used for bearings.

Electronic charting check list:

- ❏ Verify chart datum and GPS datum are the same (usually WGM 84).
- ❏ Confirm depth units.
- ❏ Check charts at zoomed-in levels for obstructions or other dangers.
- ❏ Make sure that magnetic deviation is included in any magnetic bearings given by software.
- ❏ Close all other software so that only charting software is running when a computer problem could endanger the boat.
- ❏ Confirm computer time, software time, and ship's time. If you are moving through time zones it is usually best to stay with GMT.



A Maptech raster scan chart running on Nobletec software. The control buttons across the top, and data down the right side can be configured in any way that is convenient. We periodically rearrange or eliminate this information depending on how much of the screen we want filled with the chart itself.

Situational awareness: The danger with electronic charting systems is that by automating most of the navigational process the crew tends to lose touch with what is going on around them.

If the software crashes or locks up, often there is no sign of this at first. The computer screen looks the same and unless you try to work with the program, you think it's okay (while you are looking at an erroneous boat position).

Here are a couple of ways we've found to stay alert:

- ❑ Keep a manually written log.
- ❑ Verify charted position with another nav system (radar, depthfinder, visual bearings).
- ❑ Take periodic looks around the horizon to check location.
- ❑ Periodically check computer operation by moving the cursor.

Other features to consider are the ease of laying out courses, use of bearings, and how the vessel's track is operated.

Most systems now have tides and/or currents included. We have found some of these to work really well and are a big help. Others were quite difficult to operate.

Check out how the software lighting controls work. Some have a greater range of choices. We've found that in general, the night lighting on all the systems is too bright.

Most software products display in some form information on the chart's content. Geographic area or name, how soundings are recorded (feet, fathoms, or meters) and the datum system being used. The ease of accessing this data is important.

GPS Connection—Datum

GPS connection to the computer appears very straightforward with most systems. Even we could figure it out. However, you do have to be careful to make sure the datum the GPS is using agrees with that on the charts. The norm is what is referred to as WGS 84. However, there are many other datums and they must agree.

Autopilot Connection

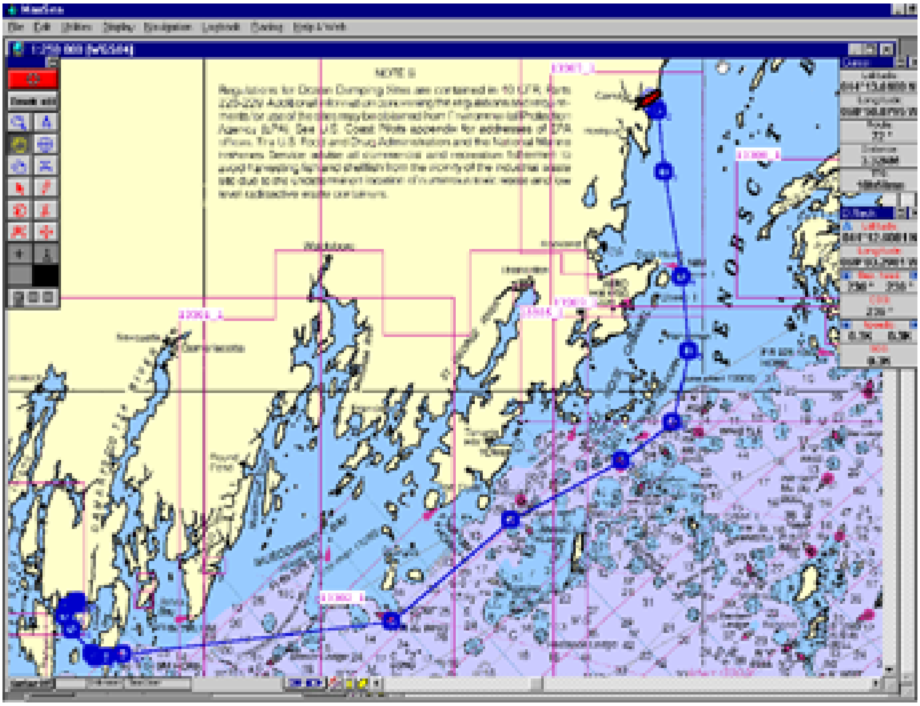
All modern software offers the possibility of driving the autopilot from the computer. However, given the tendency for all software to crash from time to time this does not seem like a good idea to us.

Using the System

Okay, let's test a system. What follows is based on using the Max Sea charting program, the last one we used aboard *Beowulf* and as of this writing, the one we feel best meets the needs of cruisers.

The Max Sea system has a great deal of flexibility, and several unique features, but what we liked best about it was the raw speed at which it zipped through zooms, pans, and changing charts. On our 433mHz laptop it appeared to run several times faster than any other raster scan system; fast enough so that the extra speed of the vector charting system was not noticeable.

Let's go back to the trip between Camden and Boothbay, Maine, alluded to in the preceding chapter. This involves as complex a navigation situation as you are likely to find anywhere. Lots of reefs and rocks, good tidal range, lots of current to set you off course, and of course, that old Maine pastime, navigating in thick fog.



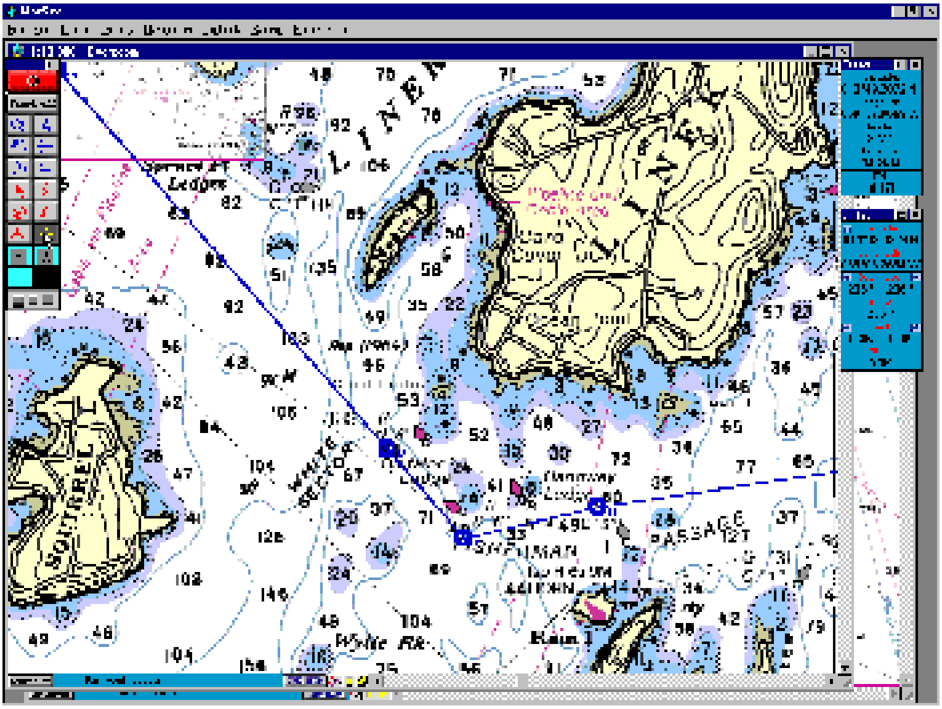
The following series of charts are all run on the Max Sea charting software. The charts themselves are Maptech raster scans.

The first step is to lay out the course between Camden and Boothbay. Each circle represents a waypoint. As there is so much detail on these charts, and so many obstructions to be avoided, we begin by roughing in the general route.

The next step is to change scale to a chart with more detail, check for obstructions, and adjust the location of waypoints if required.

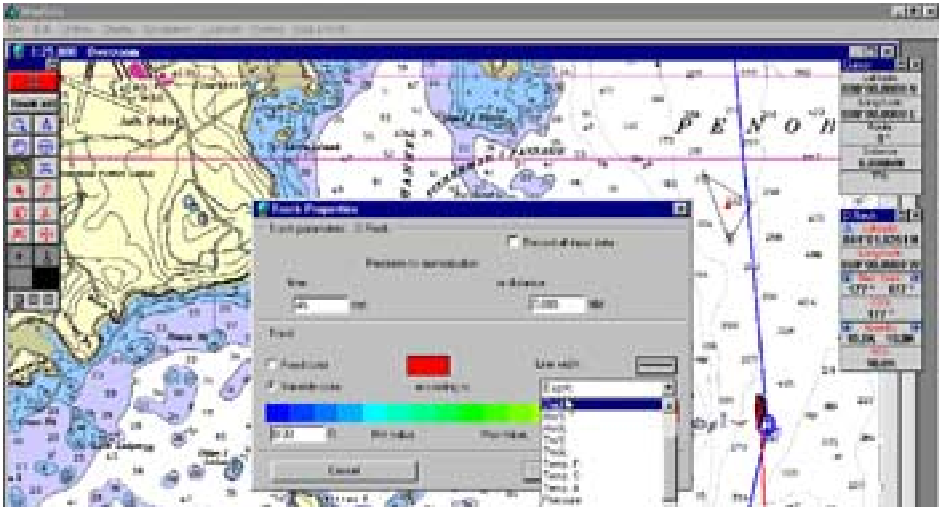
With the Max Sea system you do this with the mouse, using a scale changing "tool" from the tool's palette. Wherever this tool is placed becomes the center of the new chart. You then use the right mouse button to select from a series of available scales. We'll zoom in to the tight area in the lower left-hand corner of this chart.

Help



To move any of these waypoints simply select the edit tool from the palette (upper left corner of the screen) place it over the waypoint, hold down the left mouse button and move the waypoint. While this is happening the latitude and longitude of the selected waypoint is displayed on the right side of the screen.

Of all the features in these systems, the one which has the greatest potential to increase safety is the ability to leave a trail of where you have been. In anchorages requiring good light to exit this can be particularly helpful if you have to leave in deteriorating weather. The Max Sea system allows you to choose colors representing a range of data. It then tracks the data from your instruments. We use this feature most often with depth. We set a minimum value and then the color can be roughly interpreted to tell us what the depths were on our track.



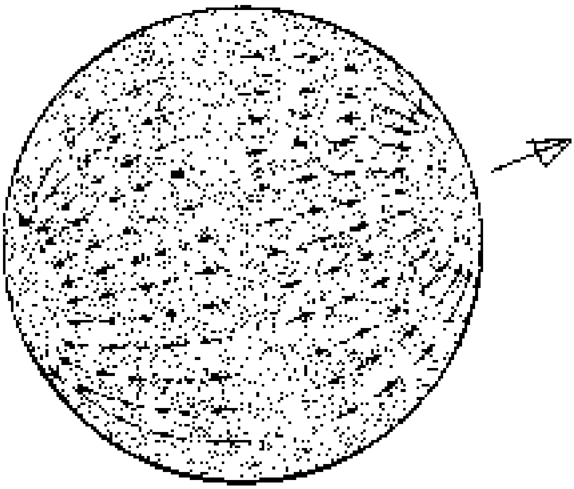
Help

TIDES

Tides are caused by the gravitational pull of the moon and the sun, in conjunction with geographic features which contain the sea level as it moves back and forth. In many parts of the world the tidal range is less than 6 feet (1.8 meters) while in others it ranges upwards of 25 feet (8 meters) on a regular basis.

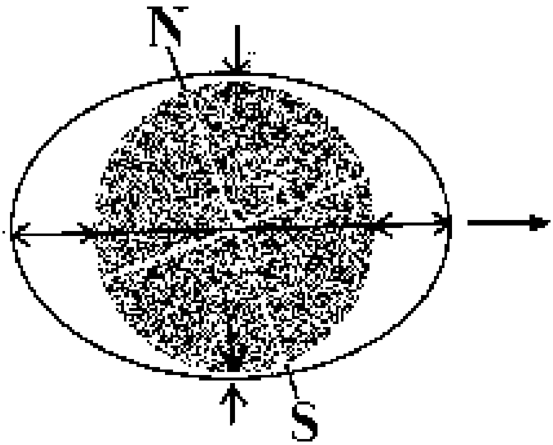
As the tide goes from high to low and back again (ebbs and flows) it is accompanied by a tidal current.

The current varies with the state of the tide. At the beginning and end of each cycle it will be weakest, while somewhere around mid-point it will be strongest.



The drawing above gives a simplistic view of the gravitational pull of the moon on the earth (the arrow points to the moon).

Below is a different view of the same phenomenon. The N/S line represents the earth's axis, about which it rotates. The elliptical-shaped outer ring represents the surface of the water, pulled in the direction of the moon. The water will be shallowest at right angles to the moon's pull (in this case, the top and bottom of the earth) and piled up the highest directly beneath the moon at the two opposite ends of the earth. Note: This drawing does not show the effects of topography or long-period waves.



Celestial Influence

The gravitational pull of the sun has slightly less than half the effect of that of the moon.

If you visualize the gravity of these bodies acting as a large vacuum, the water directly below the celestial bodies and on the opposite side of the earth is lifted, while the water at right angles to this point forms a trough.

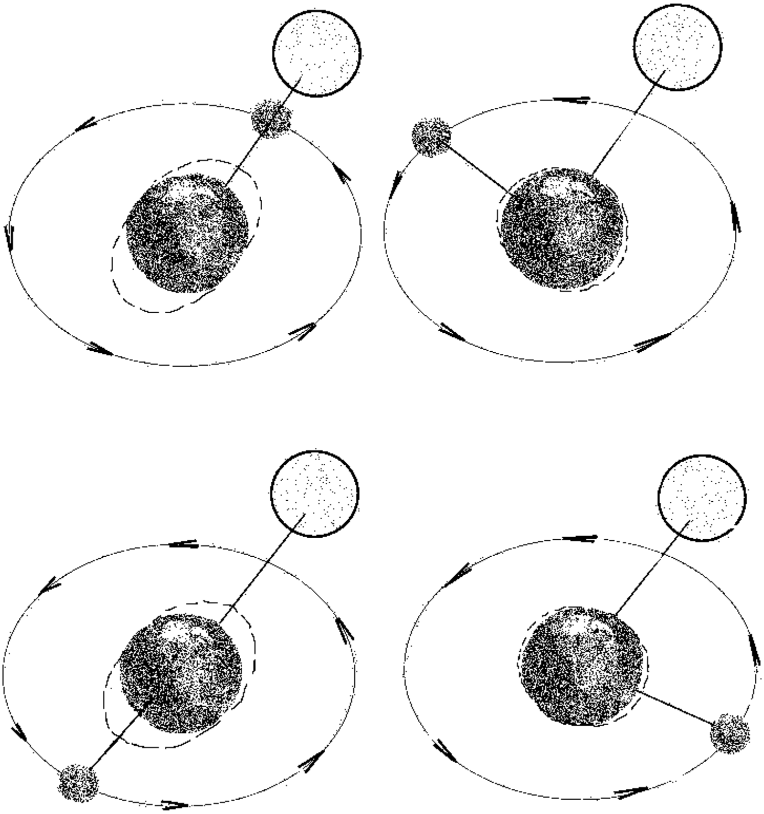
These bulges and troughs follow the gravitational influence of the moon and sun around the earth.

With no intervening land masses everything would be quite simple. But when a continent or large reef stops the flow of water, the entire back-and-forth cycle is affected.

With the moon orbiting the earth every 24-hours and 50-minutes, and two bulges of water on the earth (on the near and far sides relative to the moon), you normally find two high and low tides each day. These are 12-hours and 25-minutes apart.

Springs and Neaps

As the moon orbits around the earth, and the earth rotates on its axis around the sun, occasionally the sun, moon, and earth are aligned. When



The two left-hand drawings show the spring tides which occur when the sun and moon are aligned (with a new or full moon). At this time the gravitational forces of the two bodies are combined. Tidal heights will increase as much as 25-percent during springs.

In the right-hand drawing, the sun and moon are at 90 degrees to each other, which is when tidal range is lowest (neaps). These neap tides occur during the first and third quarter of the moon.

It is important to keep track of springs, the period each month of the highest tides. If you run aground during this period and cannot get yourself off before high water, there is a chance you will be stuck until the next springs, a month away!

this occurs the gravitational forces of the sun and moon reinforce each other, causing tides roughly 25-percent higher than the norm. These are called springs.

On the other hand, there are periods when the sun and moon are at right angles to one another, called neaps. When this occurs, they fight a bit, and so tides are about 20-percent lower than the norm.

Declination of the Moon

The moon's declination, or its position north or south of the equator also has an effect on tidal range. As you might imagine, when the moon is on the equator, the height of the two tides each day is equal.

But when the moon is north or south of the equator, the two tides become unequal. This is also true for the sun's declination, but the effect is much smaller.

Semidiurnal Tides

A given body of water has a natural period of oscillation, which varies with its dimensions and the frequency or period of the waves within it. At least, this is the theory.

However, the earth's oceans are so complex with their varying land masses that they have different oscillation periods in different areas within a given body of water.

Some of these areas—or “basins” as oceanographers refer to them—respond better to one form of oscillation rather than another.

The most common, which we’ve been discussing so far, are the semidiurnal tides, where there are two highs and two lows per every moon cycle (24-hours and 50-minutes).

Most of the East Coast of the US has this type of tides.

Diurnal Tides

Diurnal tides, which usually occur once a day, can be found along the top of the Gulf of Mexico, within the Java Sea, and in some parts of China. Diurnal tides typically have less current associated with them than those of semidiurnal format.

Mixed Tides

In many parts of the world you have mixtures of diurnal and semidiurnal tides. In this case, there are usually two tidal cycles per day, but the highs and lows vary between them (as opposed to being the same in semi diurnal tides). Most of the Pacific Basin has mixed tides.

It is important to understand what tidal reference is being used on a given chart, since it varies. The effects of different datum are shown in the drawing below.

Sun Tides

Just to complicate things a little more, there are areas of the oceans where the natural period of oscillation tends to nullify the moon’s influence and accentuate that of the sun.

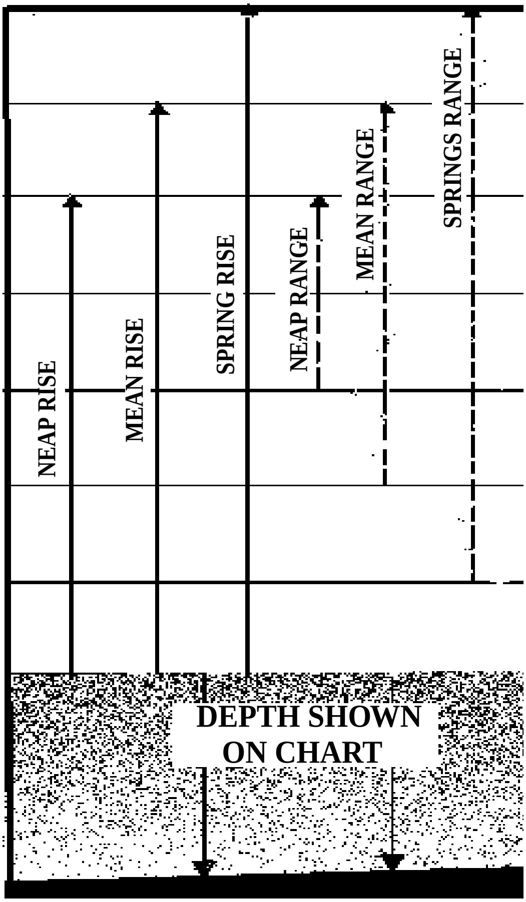
This is true for much of the tropical South Pacific. Where this is the case, you have the convenience of having high and low tides at the same time every day.

Datum

Most charts will have a tidal datum in some corner, to which the soundings refer. It is important to note this when you first look over a chart so that you have a feel for what the water depth is likely to be at different parts of the tidal cycle.

For example, the chart may refer to mean low water as the charted depth (datum). But if you are cruising in this area during springs (with moon and sun aligned) the water depth is going to be a bit less.

Conversely, if the chart uses mean low water springs for datum, you will have some extra water under your keel during much of the moon’s monthly cycle.



Help

Tidal Currents

As the tides ebb and flow, the water moves back and forth in currents of various velocities. These currents can either be a real boon to your progress, or a hindrance.

If the winds are light and your progress is slow, then a fast-running current can easily end up pushing you backwards. On the other hand, if the current is with you, speed over the bottom will be greatly enhanced.

In the open ocean, without interfering land masses, tidal currents go in a huge circle, affected mainly by the earth's rotation. As with ocean currents and wind systems, this is clockwise in the northern hemisphere and counterclockwise in the southern hemisphere.

In almost all cases you will want to have tide tables aboard for everywhere you are going to be cruising.

The tide tables may only show the major ports, but then there will be corrections for subsidiary ports. The corrections apply to both height of the tides and the time change at which highs and lows occur.

Frequently daylight savings time is not shown, so you need to correct for this, if it is a factor.

Anytime running aground is a risk, or you are unsure of the tide or current relationships, it makes sense to write the day's tidal data in the log where it is handy, in case you need it in a hurry.

In Restricted Areas

In restricted areas the final flow becomes more reversing in nature. In rivers or narrow estuaries the current flow will usually follow the tidal level, but not always.

In most areas current data available is for each tidal cycle. However, here are a couple of general rules which may help.

First, slack water usually occurs halfway between high and low tide. Current strength peaks halfway between slack and high or low. If this is shown graphically, the graph typically looks like a sine wave.

However, the beginning and end of flood and ebb tides do not always correlate to the beginning and end of current flows.

Current Flow and Tidal Range

The velocity of the current flow is typically proportional to the tidal range. Thus, at springs, with the greatest tidal range, you have the strongest current. The opposite is true at neaps, with its currents.

Now to make things more confusing you need to be aware that there are places in the world where current strength and tidal range do not correlate. So, consult your local current atlas or pilot books!

Playing the Currents

If you've done any racing you know that playing the currents right is a huge part in winning races. Commercial fishermen use currents to reduce their fuel bills.

The best system is to ask the locals. If that isn't possible, keep in mind that currents flow faster in deep water and slower in the shallows on each side of the channel.

And, as we've mentioned already, areas of back eddies or counter-currents are frequently found near headlands.

If you are sailing along the shoreline, expect to find weaker currents in close to shore and faster currents as you move offshore.

The time will eventually come when, in spite of all your planning, the tidal current turns against you and progress towards your destination becomes difficult, if not impossible.

When this happens, don't despair. Simply drop the anchor, get out a good book and a cold drink, and wait until the situation becomes more favorable.

Darwin, Australia

For the most part the range of tide and currents in the Solomon Islands and New Guinea is relatively mild. But enter the Torres Straits on the northwestern corner of Australia, and things change in a hurry. Now you are in the influence of Indian Ocean tides, and the results can be amazing.

Intermezzo is gliding along under #1 jib topsail, staysail, main, and mizzen as we pick up the light on the eastern corner of the Dundas Straits, the gateway to northwestern Australia.

An undercurrent of excitement runs through the crew. Civilization is but a day's sail to the south. Shopping centers, ice cream stands, movies, and supermarkets all await us after a year in the Melanesian wilds.

But first we must thread our way through the shoals and islands of the Van Diemen Gulf and Clarence Straits. By watching for the munificent array of navigation lights (supposedly working) and using our radar, there shouldn't be a problem.

But there is a catch: tides and currents. Even though we have planned our arrival to coincide with the neap tide—when the moon and sun are at right angles, exerting the smallest force on the ocean's waters—we are still looking at 16- to 18-feet (4.9- to 5.5-meters) of change and 3- to 5-knot currents.

Diagrams in the *Admiralty Pilot* shows the points of maximum ebb and flow for various periods in the tidal cycle. We will have to kill time once we reach the middle of the gulf to wait for the tides to switch. It's better to sit and wait a bit than buck the flow.

With the Clarence Straits now behind us and the lights of Darwin twinkling in the distance, we begin to clean ship in preparation for our arrival.

It isn't long before the anchorage in front of the Darwin Yacht Club is at hand. We note that it is filled with cruising yachts, many of them carrying old friends from New Zealand and Polynesia. But first we must find a good spot to anchor.

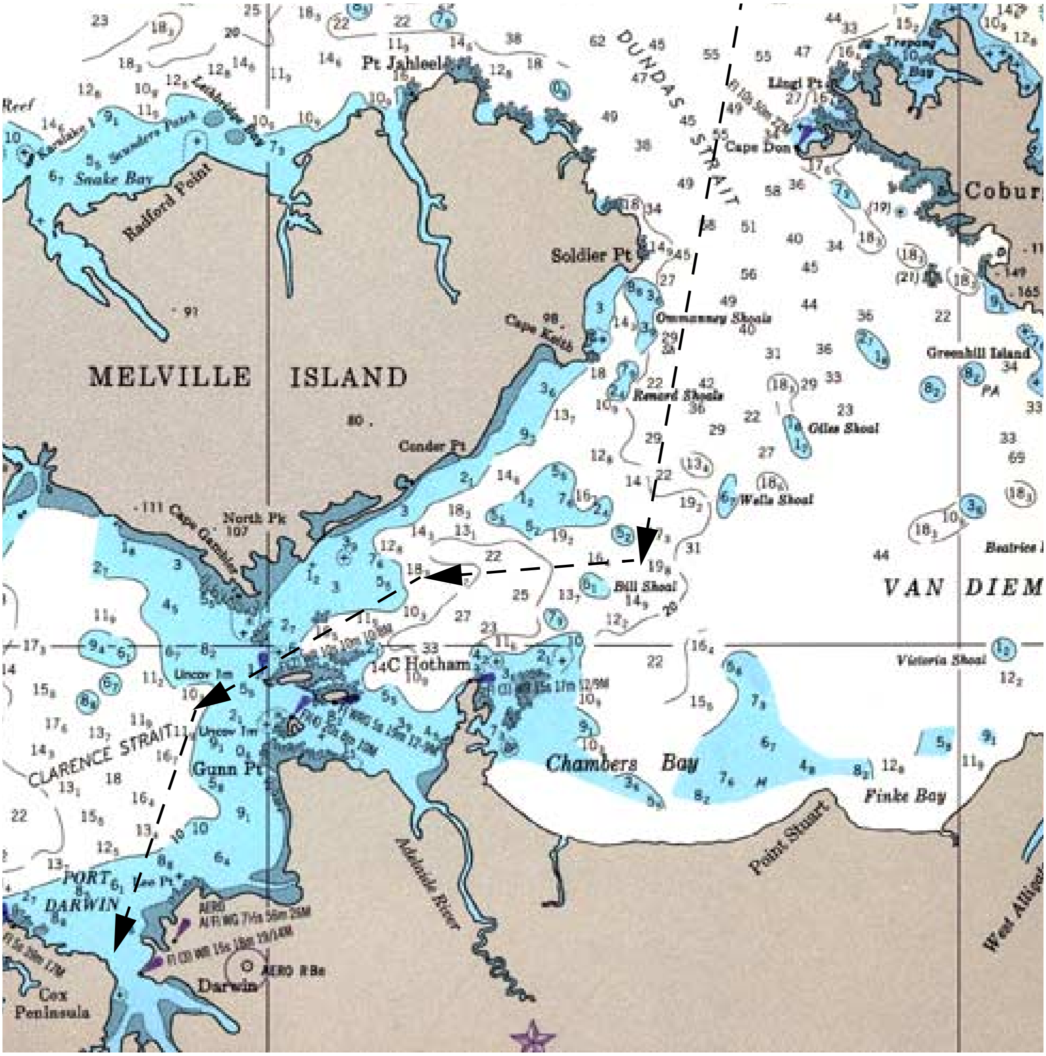
The bay is wide and gently shoaling, and at high tide there is water right up to the front of the yacht club. At low tide we need to be a mile from shore. The outboard will see service here!

(A week later, the entire fleet moves another 1/4 mile offshore. With the moon and sun beginning to pull together on the earth's oceans, the tidal range increases up to 24 feet/7.4 meters.)

At low water there is 1/2 mile of beach exposed in front of the yacht club. Trips ashore with the dinghy have to be planned carefully. If we go in at high water, pull the dink up on the beach, then return at low tide, we'll have a long haul through the sticky sand before we get the dinghy floating again.

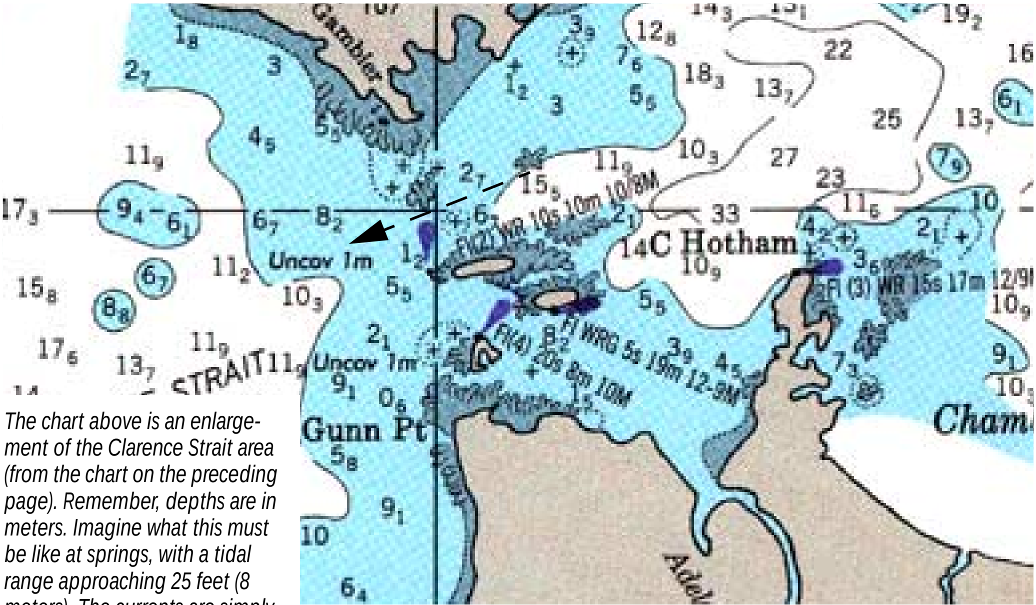
Conversely, if we're ashore at low water and anchor the dink, there could well be a long swim in store.

Most of the cruisers in Darwin solve the problem by coming ashore in pairs. That way one dinghy can be left anchored offshore and another on the beach close at hand.



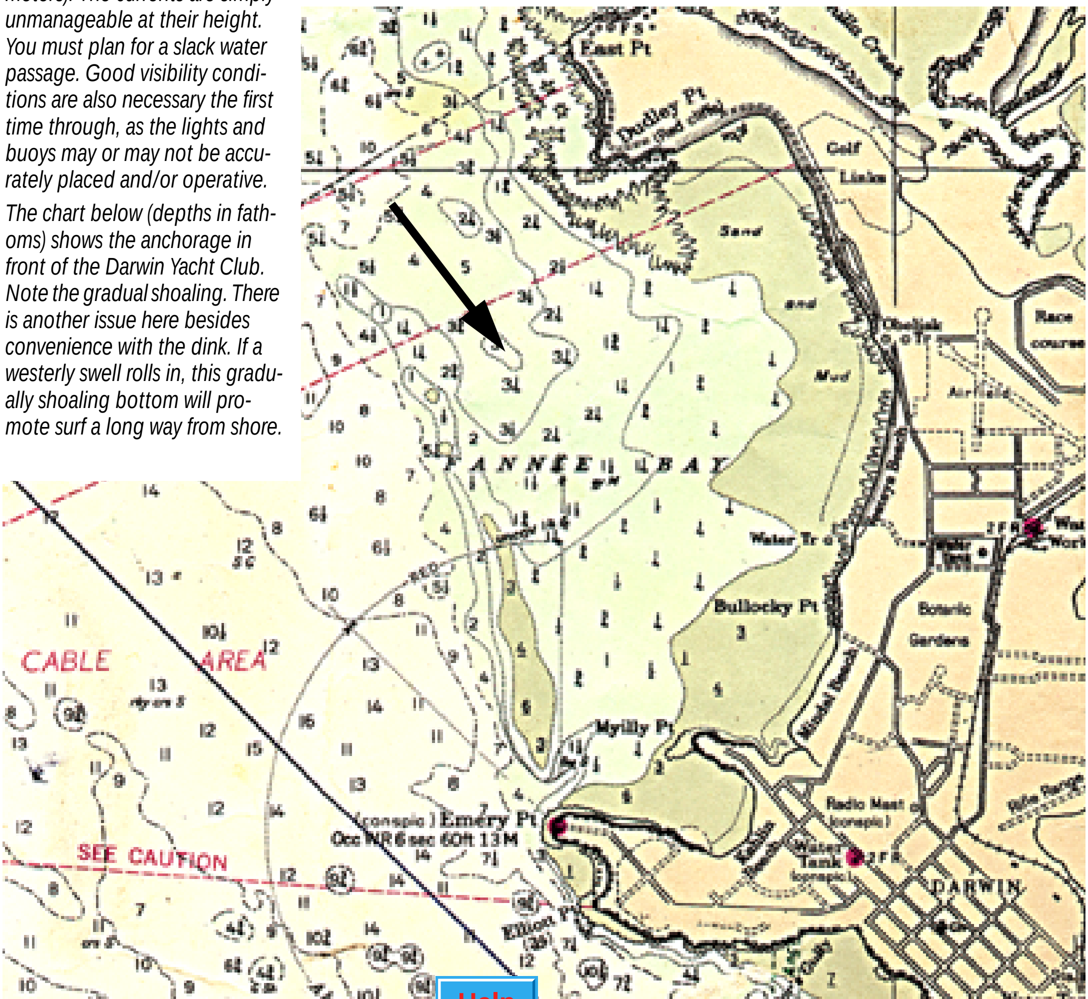
The approach to Darwin via the Dundas Straits is tricky in terms of navigation as well as dealing with the tides and currents. The depths shown are in meters, so you can see there are some pretty thin spots. Look at the narrow areas through which large volumes of water must pass, and you can get a feel for how treacherous this can be with strong tidal flows! When approaching this type of situation for the first time it is best to do it at neaps, when the tidal range (and thus currents) are at a minimum.

Help



The chart above is an enlargement of the Clarence Strait area (from the chart on the preceding page). Remember, depths are in meters. Imagine what this must be like at springs, with a tidal range approaching 25 feet (8 meters). The currents are simply unmanageable at their height. You must plan for a slack water passage. Good visibility conditions are also necessary the first time through, as the lights and buoys may or may not be accurately placed and/or operative.

The chart below (depths in fathoms) shows the anchorage in front of the Darwin Yacht Club. Note the gradual shoaling. There is another issue here besides convenience with the dink. If a westerly swell rolls in, this gradually shoaling bottom will promote surf a long way from shore.



Help

KEEPING TRACK

Keeping a ship's log is an essential ingredient in successful vessel management. It's an obvious necessity from a navigational standpoint, and a well-kept log can help in keeping track of maintenance requirements.

From a historical perspective it can be enjoyable and informative to flip through the pages of past voyages (although gales which have grown with the telling over time may die down a bit, and boat speed almost invariably suffers in its written form!).

Last, writing up the log provides a few quiet minutes every so often to get your thoughts in order.

The type of data that is helpful to write up will vary with the nature of your passage, navigation difficulties, risks to be avoided, and systems aboard which need monitoring.

Some folks like to keep a very formal log with entries every hour on the hour, or whenever a significant event takes place. We find our own log entries tend to be a bit less scheduled, averaging perhaps two hours between notations. However, if tricky piloting is involved, we make more entries.

The log constitutes a legal record of the ship's history, and in some cases may be helpful in settling insurance claims. It also can be important if you become embroiled in litigation. For these reasons it's important that careful, detailed accounts be written of any problems that conceivably could lead to a requirement for good records.

There are some historical benefits to your log as well. When you're considering a new boat, or some changes in the present one, the log will help refresh your memory on your feelings, and how the boat reacted in a variety of past situations. Re-reading the log is often necessary to get a realistic appraisal of events or conditions that you may not remember accurately. Keeping track of maintenance requirements, repair costs, and even fuel and water consumption, will yield valuable benefits later on when the time comes to evaluate these trends.

The Logbook

We've found that keeping our log in a three-ring binder on pages we've had custom-printed is the most satisfactory system. The printing is inexpensive, and allows us to use exactly the right format for our type of cruising.

It pays to use paper of the highest quality.

Our logbook is divided into three sections. First we have the day-to-day operating log. The second section has our maintenance log for machinery and electronics, while the third section is the never-ending "to do" list.

The logbook can be turned so you write across the long dimension of the page if your form involves a large amount of data. I like to leave the left-hand (or bottom) page blank for use with miscellaneous notes and observations, while putting the recurrent information on the right-hand (or top) side.

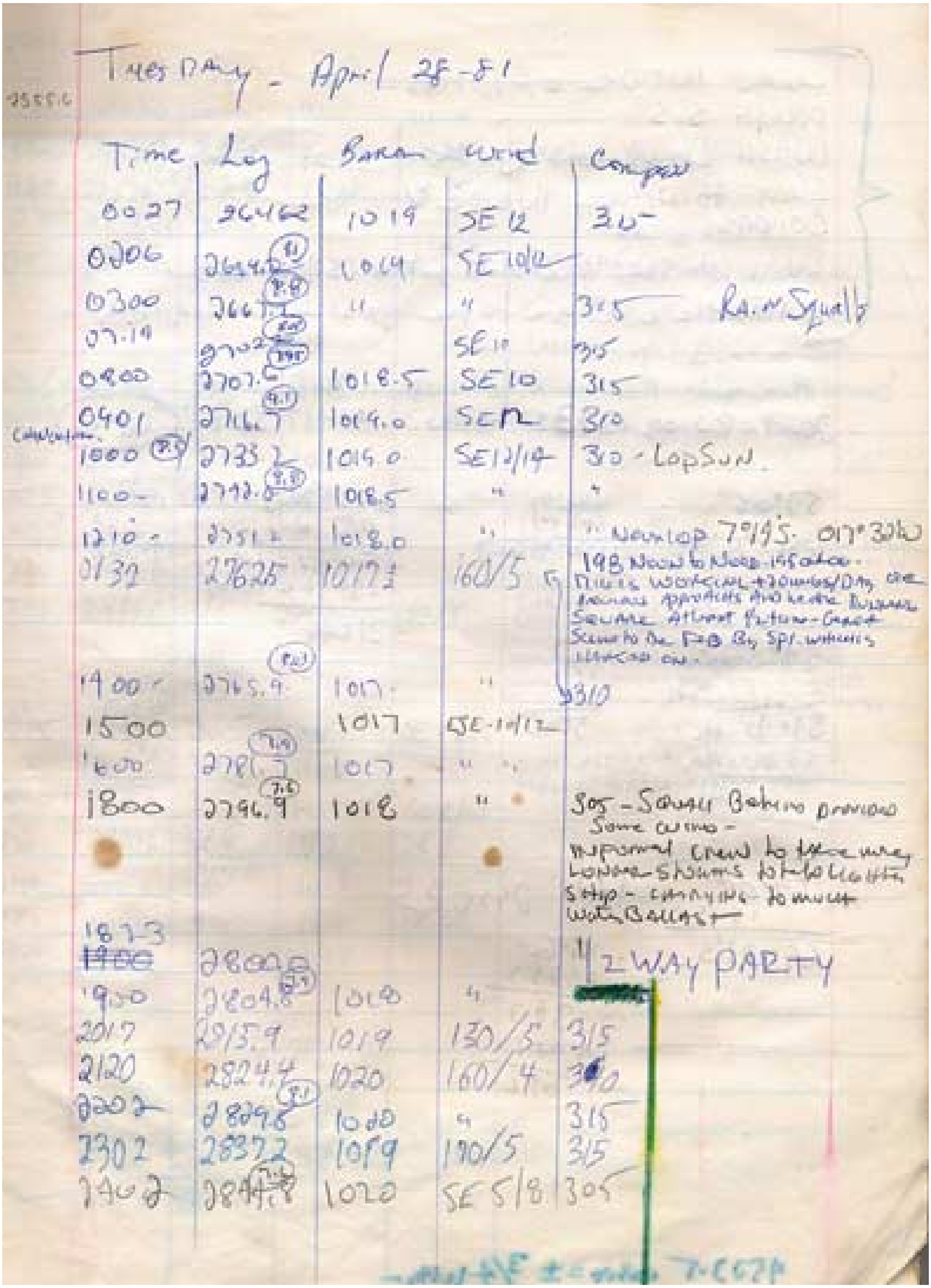
The front of our log has several pages of data on radio frequencies, compass deviation tables, and some general piloting notes such as magnetic-to-true compass reading rules.

Before leaving on a trip we usually do some preplanning in the logbook. Notes on lighthouses or buoys and their respective characteristics, tidal state, current, and speed-distance calculations usually find their way onto paper.

Entry Data

Our first entry on a passage will indicate the point from which our departure is taken. We may note the destination towards which we're heading, but a definitive statement that we are going to a specific location is avoided. There's no sense in tempting the sea gods into a contest of wills!

Once underway our entries will start with the time, compass course, log reading, position coordinates, and boat speed for the last hour. Then the barometer reading, wind direction, windspeed, and sea state are noted. Machinery data is next. Engine rpm, water temperature, oil pressure and perhaps exhaust gas temperature are written down.



Tuesday - April 28-81

Time	Log	Baro	Wind	Compass
0027	2646.2	1019	SE 12	320
0206	2654.6 (8.1)	1019	SE 10/12	
0300	2661.? (7.8)	"	"	315 Rain Squalls
07.14	2702 (8.0)		SE 10	315
0800	2707.6 (7.95)	1018.5	SE 10	315
0901	2716.7 (9.1)	1019.0	SE 12	310
1000 (8.5)	2725.2	1019.0	SE 12/14	310 - Lop Sun
1100	2733.0 (8.3)	1018.5	"	"
1210	2751.2	1018.0	"	" Noon Lop 7°19'S 017°32'W
1132	2762.5	1017½	160/5	310
1400	2765.9 (8.0)	1017	"	
1500		1017	SE 10/12	
1600	2781.7 (7.9)	1017	" "	
1800	2796.9 (7.6)	1018	"	305 - Squalls behind previous. Some wind - informed crew to take more longer showers to lighten ship - carrying too much water ballast
1823 ~~1800~~	2800.0			½ WAY PARTY
1900	2804.8 (7.7)	1018	"	
2017	2815.9	1019	130/5	315
2120	2824.4	1020	160/4	310
2202	2829.8 (8.1)	1020	"	315
2302	2837.2	1019	190/5	315
2402	2844.8 (7.6)	1020	SE 5/8	305

Help

Previous page: Ancient history! A page from the logbook of Intermezzo II on her passage from Cape Town, South Africa to Antigua in the West Indies. This page documents a momentous day. We were halfway, always cause for a celebration and presents (as are quarter- and three-quarter-waypoints as well).

As this was before the days of long-range nav gear, we were working on dead reckoning and celestial.

Today, our log entries will have the current latitude and longitude written in, as well as the speed and heading data.

Taking the time to record your thoughts and feelings above and beyond the operational necessities is also a good idea. Leafing through an old log, after the years have passed along, takes you back and helps you to relive the old experience.

There will usually be a note about the source of navigational data (i.e. radar, GPS, visual fix), and a comment on the quality of the navigational data if at all suspect. When we're strictly depending on dead reckoning for navigation, our DR position is put down in lat/lon format at least every four hours. This is just in case there's an emergency on board requiring a quick broadcast of our position.

Weather Trends

Along with the basic weather data already mentioned, if we are keeping an eye on certain weather systems we write down the logic of what we think the weather is doing. For example, if there is a low pressure system to the west or southwest and we are heading east, we will note that we are changing course to the southeast so as to have the center of the low pass to our north (and thus ensure fair wind direction).

A timetable is usually associated with this logic, so we'll note by what time we expect certain barometric pressure, cloud, and sea state events to occur.

This approach provides a valuable reference to look back upon as the weather develops. If things are not going as hoped, we can spot the change in trend earlier, allowing for more leeway to modify our tactics to suit the developing weather.

Onboard Conditions

Finally, we'll make a few general comments about conditions aboard, the sails we're carrying, how the boat is behaving, or the type of job the autopilot or vane is doing. If a special event has occurred, such as a course change, a navigation bearing, or we have just reduced a celestial sight, that data will be noted as it happens.

Using the Data

There are many ways in which this data will be used. Navigationally, it's a continuing record of our progress based on dead reckoning or fixed positions.

Should the electronics go out, or some atmospheric phenomenon require us to switch to manual navigation, we have a record of our most recent location and an idea of the quality of that data.

With weather we are looking for patterns. Barometric pressure, specifically its rate of change up or down, is the primary factor in onboard weather forecasting. Coupled with a general area radio weather forecast and observations of change in wind direction and cloud cover, we have the data we need to warn of approaching storms or shifts in wind direction.

With machinery, too, it's the pattern of operating information that is most important. A major deviation from normal readings will be cause for immediate investigation by the watch. But over a longer-term period one may notice a gradual increase in engine operating temperature or drop in oil pressure. Perhaps it's only a small percentage, but that can be enough of a precursor of trouble to save major repair bills.

Celestial Navigation

If you can read, add, and subtract, you can *easily* work celestial observations. There is no magic to it, and only modest skill with a sextant (something easily acquired) is needed. And if you ever suffer a power failure or take a lightning hit which wipes out all your electronics, including your handheld GPS, the celestial skills will come in very handy.

Celestial navigation is fun, and having the GPS to check your lines of position or fixes against is an excellent way to grade yourself—without risking anyone's safety.

You can learn celestial in a weekend course or by teaching yourself. And if the day ever arrives where you are without electronics, you will be very happy indeed to have this skill aboard.

What to Learn

The easiest celestial sight is a noon shot. This gives your latitude, and if you are careful with shooting a series of shots to find the overhead passage of the sun, a rough longitude as well.

Just like in the olden days, if you only know your latitude, once you are on the appropriate latitude for your destination, head due east or west and you will make your landfall.

Next comes a sight reduction for the sun, giving you an LOP at an angle to the noon shot (your LOP with a noon shot always runs east and west). This involves a couple of more steps, using a sight reduction table. Don't worry—this just means looking up the data, and then doing some very simple plotting.

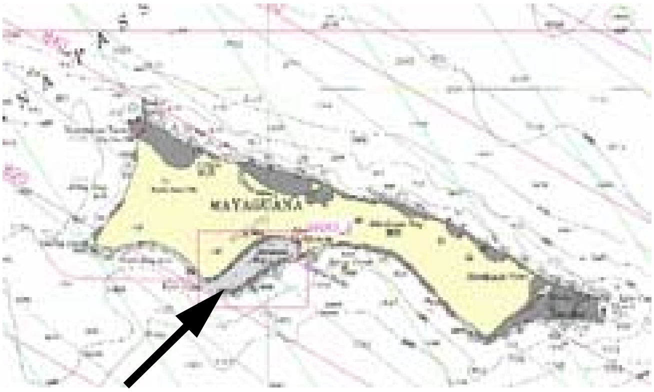
For evening work we like to use the moon. Although not considered as precise as the navigational stars, it is easier to find and often you can take moon sights during much of the evening.

Finally, if you really get into celestial, you will be doing "rounds" of stars and planets. In this process you shoot three or four heavenly bodies at twilight, and then create LOPs from each sight. If they are done correctly, you will find all of the LOPs crossing in a small area—a very satisfying feeling.

Hardware

The first thing you need is a nautical almanac containing the data for the sun, planets, and navigational stars. Next is a set of sight reduction tables. The most popular and easiest to use is called HO 249. You also need a good timepiece, since the exact time is a critical part of accuracy. Almost any $20 watch will do the job, but it should be checked periodically against WWV or the GPS.

Finally, you will need a sextant to measure altitude. These range in price and quality. But as a backup, a number of plastic units on the market have a good reputation.



Jubilation

We want to close this section on navigation the same way we opened it, with a cautionary tale. Geoff Steel and his four children had been living aboard *Jubilation* and cruising the East Coast of the US, Florida Keys, and Bahamas for eighteen months.

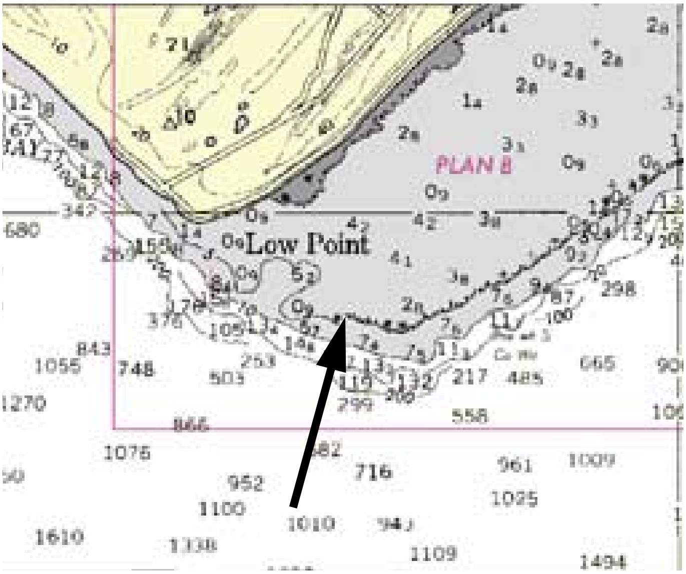
Above, Jubilation, a fiberglass Roberts 58 sailing in happier times. The top chart is an overall view of Mayaguana Island.

Below is a detail of the corner of the reef where Jubilation struck. They were just a couple of boat lengths from the pass, to their west. Depths are in meters.

On March 20, 2000, they were approaching Abraham's Bay on Mayaguana, at noon, with a partially overcast sky. They were using the BBA Chart Kit for the Bahamas and had picked off a series of waypoints for the journey, transferring these manually to their GPS.

As they made their approach Geoff noticed the water rapidly shoaling, and realized that they were not in the cut through the reef. He backed down hard, bringing *Jubilation* to a fast stop, in order to get his bearings. With the sun dead overhead and a patchwork of shadows from the clouds, it was difficult to tell deep from shallow water.

They began to back out the way they'd come in and as is often the case the stern started to swing, and then hit a coralhead. They then began to power ahead, with hard port rudder, and within a few seconds had hit a second coralhead. This brought the boat to a stop.



There was a moderate (Geoff says 4-foot/1.2-meter) swell running and this began to push *Jubilation* onto the reef. Each swell lifted her up bumped her further into shallow water. Geoff says "as we crashed again and again the

Help

Geoff Steel photos

If the charts cannot be relied upon how do you know if there are shallows or reefs around? We'll be covering the warning signs to look for in the next section. But for now, you can see an excellent example in these photos.

Note how the sea has humped up in the foreground of both images. This is a sure sign of shallow water. If visibility below the water's surface is poor changes in the sea state can still give you a leading indicator of what to expect. That will be especially true where you have very deep water abutting a reef or rock, as is the case here.

trailing edge of our 7-foot (2.1-meter) keel literally began to break apart. The rivers of water pouring in through the breach couldn't be stopped, so we gathered up as many things as we could and abandoned her to the sea."

Two days later Geoff dove on the wreck to survey the damage. The keel was partially gone and a 10-foot (3-meter) section of the starboard side had split open. Later that day *Jubilation* was towed off the reef into deep water where she was allowed to sink.

Geoff's final comments are worth remembering. "I attribute this accident to the innacuracies of the BBA charts and my inexperience in reading water depth on a partly overcast day. I don't think it can be overstated that charts, whether paper or electronic, are only 'aids to navigation' and do not take the place of prudent seamanship and an experienced eye. And we should have had a lookout aloft, at the lower spreaders."

Lessons from *Jubilation*:

- ❏ Never totally rely on charts or other aids to navigation.
- ❏ Watch the sea for signs of shallow water when closing with shore.
- ❏ Have somebody up high to watch for shallow water.
- ❏ If you hit and cannot get off immediately, set an anchor immediately.
- ❏ Work as hard and as fast as possible to free the boat before fatal damage is done.

Help

Heading in towards shore in inclement conditions, especially after a long passage, is often a difficult call. Do you take a chance and close with the shore, hoping visibility will improve, or trusting implicitly to the GPS? Or do you heave to, waiting an hour or two for conditions to improve?

Our choice is always to wait. The time spent hove to can be used to clean up the boat, or have the crew alternate with naps. Then, once visibility is acceptable, shore can be approached.

In the photo above Sundeer is closing with Kauai, in the Hawaiian chain, after a 10-day passage from California.

Closing with Shore

Both of us feel that most of the risks inherent in cruising occur close to land. Once we get offshore, well outside of shipping lanes and away from land, we start to relax.

On the other hand, as we start to close with the shore, we both get a bit nervous. It is the land that will grab your boat and hang on if you make a mistake, so we use an extra degree of caution when land/or underwater obstructions are close by.

In the following section we will deal with the subject of closing with shore, the inherent risks, and how to deal with them. More so than some of the other topics in this book, there is a lot of “feel” to the process of piloting close to shore.

There is simply no substitute for real-world experience. Nevertheless, you can usually quantify the difficulty and risk factors with different cruising areas. This makes it possible to stay within your skill or experience level, until you are ready to move up to more challenging cruising grounds.

The learning curve is not that steep. The main thing is to be on deck, and be alert to your surroundings. After awhile much of what you read about in this section will become second nature.

Help

Sea Room

A basic tenet of defensive seamanship is that sea room equals safety. When weather or visibility deteriorates, it is almost always better to stand off, maintaining or working to gain more sea room.

Temperate Weather

In nice conditions adequate sea room is a function of how you evaluate your risks. The first question is always navigational in nature. If the charts are off, or you've made a mistake in plotting your position or interpreting the radar, how much room do you need to take corrective action?

In the backs of our minds, we are always wondering what happens if the engine quits, or the steering fails, or there is a problem with the rig?

At the very least, we need the time to get an anchor set or the sails hoisted (if we are under power), before we hear that crunch of hull meeting land!

Inclement Weather

There is no more dangerous action in any vessel than closing with the land under inclement conditions, where navigation is less than precise, and where a sea may be running.

Prudence dictates standing offshore until you have good visibility; until you know your position exactly, and until the wind and sea conditions are favorable.

Quantifying sea room is very much a function of design, and how well a given vessel works to windward in adverse conditions. The flat-bottomed centerboard schooner shown above needs to allow a lot more space from the lee shore, than a more modern design.

In the olden days it was the norm to have to fight for every inch of searoom possible when weather threatened. Those that started early and gained offing survived. The captains who missed the signs and didn't have enough sea room lost their vessels.

In relatively calm conditions searoom isn't as critical a factor. But when conditions become boisterous, as shown in the left photo, you need to exercise more care.

In this case, Intermezzo is approaching the island of Rodrigues, in the Indian Ocean, in fresh trades and big seas.

The harbor "entrance" is a tiny cut in the reef, and we will need to wait for the wind and seas to die down a bit before working our way in.

The amount of distance needed varies with the weatherliness of your vessel and the navigational difficulties of keeping station.

If you're avoiding a lee shore (or the prospect of the land becoming a lee shore), the less weatherly your yacht, the more distance is required.

If the problems are navigational, assume what your worst position could be and add a safety factor. When low land/or reefs are about, we don't feel comfortable unless there are at least 20 miles between our worst possible position (as opposed to where we really think we are) and the obstacle in question. If heavy weather is the threat, a couple of hundred miles is even more comfortable.

If this means a day or so hove to when a calm anchorage seems to beckon, remember that more yachts have been lost by mistakes with the land than any other cause.

The less experience you have at sea, the more alluring land will be. But there are times when you should resist the call until conditions improve.

Navigational issue check list:

- ❑ Does the crew have first-hand experience with the landfall?
- ❑ Study charts and pilots.
- ❑ Note state of tide.
- ❑ Check chart and GPS datum.
- ❑ Verify whether depths are in feet, fathoms, or meters.
- ❑ Determine operation and location of buoys and lights.
- ❑ Find out state of harbor entrance. Is it subject to breaking?
- ❑ Review weather and forecast between now and when port is made.
- ❑ Are there shoals which move?
- ❑ Check on any new obstructions (such as wrecks).

Navigational Issues

Let's look at the navigational issues first. Foremost is the crew's familiarity with the lay of the land in anticipated weather and sea conditions.

Having been there before makes things easier. You'll know what to expect, and how to better judge the conditions.

On the other hand, exploring new territory, it's good to take plenty of time to study the charts and pilot book. If the chart doesn't show critical data like navigational light characteristics, make your own notes on the chart.

Significant passages in the pilot and critical depth contours will be outlined in yellow or red.

Compare the chart datum to the GPS to make sure they are in agreement. Highlight state of tide and whether the chart reads in fathoms, feet, or meters.

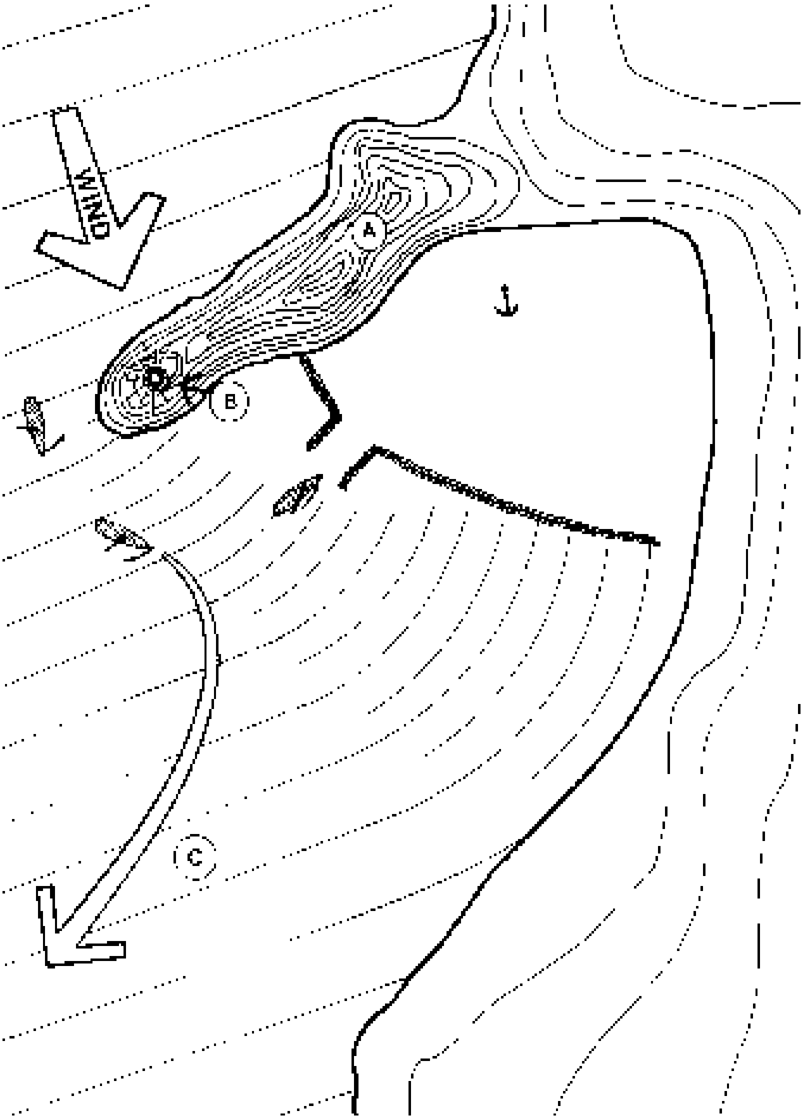
Sometimes one can raise the harbormaster or another yacht on the radio to check local conditions.

At this point it is a good idea to ask if the lights are working and confirm their characteristics, note if there are any obstructions not shown on the chart, check about new shoals, and find out about wind, sea, and bar conditions.

If There Is No Choice

Occasionally a situation may arise where it appears safer to make for shelter. A medical emergency may force your hand, an imminent storm that you're not equipped to handle may be approaching, or the navigational dangers of standing off may be greater than those of closing with the land.

If caught in such a situation, there are three sets of factors to be analyzed before heading towards shore. First are the questions of navigational accuracy and the familiarity of the crew with the harbor in question. Next is the weather—that which exists currently, and that which is expected



An ideal landfall in difficult conditions. The headland (A) provides an excellent visual landmark and good radar return. On the leeward side of the headland (B) is a lee which will reduce wave sizes (eliminating direct waves, although seas wrapping around the headland cause a problem). And finally, there is an easy exit route (C) if things start to go wrong. Just jibe and head back out to sea.

before harbor is reached. Third are the offshore sea conditions, and situations likely to be found closer to land/or at the harbor entrance. Each of these factors should be weighed carefully, judging inshore risks against those of remaining in deep water.

Topographical Analysis

The type of landfall you're shooting for and the layout of the shelter will have the largest impact on your decision to stand off or seek protection from the land.

The ideal situation is a steep-to high landfall with no offlying hazards. If you simply have to find a distinctive point, run down in its lee, and head up, nothing could be easier. But what if the harbor is fronted by a long, low-lying sandspit, or worse, surrounded by shoals?

It's essential to consider your options in case something goes wrong. Suppose you identify the wrong headland. Can you beat offshore again? How precise does your navigation really need to be? Can you work in close to the land, find out where you are, and still make it to shelter in time? Or, do you get only one shot at the harbor entrance?

Many harbors of refuge are fronted by shoals or breaking bars, which brook no mistake from the unwary.

Harbor Entrance Conditions

Another major consideration is the condition of the harbor entrance. Does it tend to break the sea? If it's okay now, what will it be like when you arrive a few hours hence? Remember that tidal state and current flow have a big impact on breaking bars, as do prevailing wave systems.

By thinking through these scenarios in advance, you will be better prepared to make sound judgement calls under stress.

Running the entrance either at slack high water or just before high water with the tide flooding, will mitigate a tendency to break.

And what about the wind and storm waves? What will they be like in the harbor vicinity when you finally arrive?

Position Fixing

Then you have to consider position-fixing. This varies according to time of day, visibility, and the type of land being approached.

Outstanding landmarks make life easier. But if it's a low spit of land you're approaching, or perhaps just a sea buoy on the end of a reef, you must consider the possibility that you may not be able to make the necessary identifications in time.

Remember that the present visibility may change by the time you really need to see well. If a full moon is expected later on in the evening, for example, you might delay your approach until the moon is in its optimum position for visibility.

With GPS everyone tends to relax a bit on navigation, but we are always more comfortable depending on a positive visual fix than on anything that is derived electronically.

Be sure to consider sun and moon angles. Visibility of land and water will be best with the source of light behind you.

If electronic navigational aids are to be used, try to find a way to have two or preferably three sources of data. As we've said before, relying on any single position-fixing aid is risky.

It's easy to sit here at the computer writing these words, making everything seem so pat: Just analyze the data, come to a decision, and act. But with an emergency aboard, inclement weather, and with the threat of lee shore, the decisions will not come so easily. A potent dose of adrenaline, fear, and uncertainty about the future can cause actions which in hindsight look stupid. By thinking through these scenarios in advance, you will be better prepared to make sound judgement calls under stress.

Crew and Vessel Capability

The capability of your crew and vessel must be weighed against the expected conditions. If you have a balanced hull form with good surfing control and lots of boat speed at your disposal, running a breaking bar may not be nearly as dangerous as in an older design with a keel-hung rudder.

Also consider what happens once you've gained the shelter's entrance. Will you be running down the channel, or will it be a beat or a reach? What happens when it's time to stop? Do you have that sort of maneuverability?

Will conditions allow a slow approach with more time for vessel and crew to react, or will you have to keep up speed because of weather or tidal state?

When you know a quiet anchorage awaits just a few hours away, perhaps with friends waiting for a social gathering it can be hard to halt forward progress and wait for better conditions. The allure of the anchorage is often overwhelming.

But when you are debating whether to stand offshore or head in, keep in mind that more cruising yachts are lost trying to make landfall in inclement conditions than from any other cause.

Maintain Sea Room!

Generally the answer is simple. Stay offshore. If the only result of standing off is some discomfort or a late arrival, accept it. The alternative could be worse.

But if survival weather or other problems force you to consider the unpalatable alternative of seeking shelter, do not rush into your decision. Consider every aspect of the situation. Prepare yourself, your crew, and your vessel for a possible disastrous result.

If this means issuing life jackets and having the raft ready, so be it. It is always safest to be realistic and acknowledge the risks of seeking shelter under less-than-ideal conditions.

A hazy sky can make it difficult to determine where you are in relation to certain landmarks.

Inland high mountains may show up as islands, and low-lying shore may not be seen at all—either on radar or with the naked eye.

However, there are almost always other clues to be found in the sea.

Signs of Approaching Land

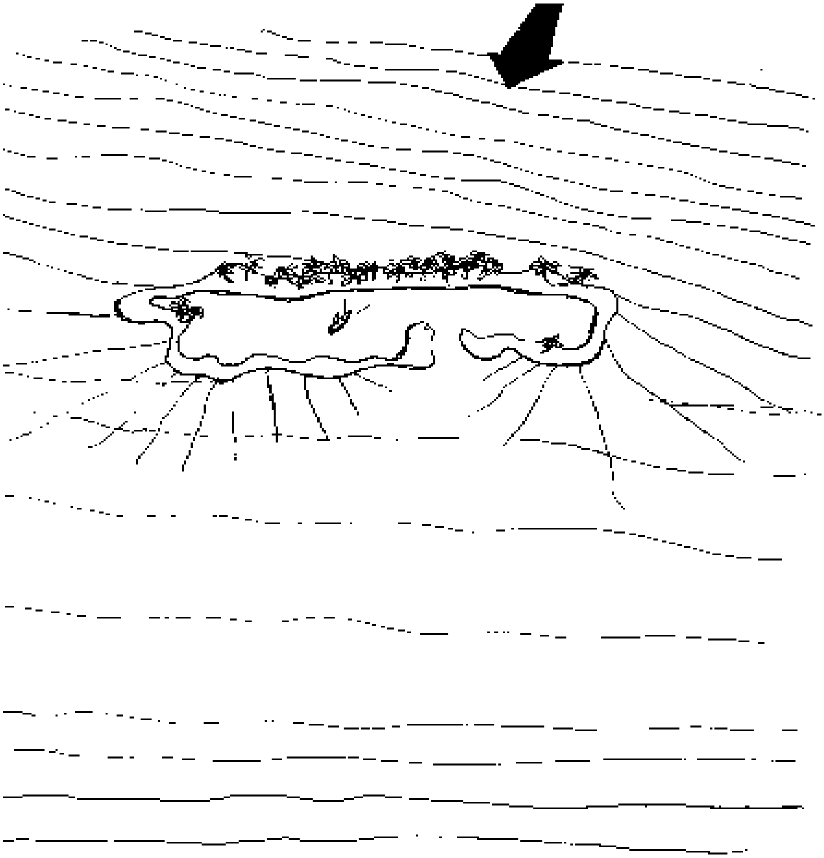
It wasn't too many years ago that most approaches to land were made with a leadline along with a keen sense of smell, hearing, and feel for the heave of the sea.

As mentioned earlier, it was common for a clipper ship to leave China, and then four or five months later, without having made a celestial or visual fix in months, successfully work their way into a fog shrouded harbor on the eastern seaboard of the US. Of course mistakes were made and lives and ships lost. By and large, however, most voyages ended safely.

Even earlier, well before Europeans were venturing down the African coast, Polynesians made long open-ocean passages between land masses. They had their own form of celestial navigation, and relied on reading the natural signs of approaching land for successful landfalls.

Nowadays, with GPS and radar so common, you may not think these skills are necessary. However, one never knows what the future holds. Perhaps you lose power, or a lightning hit takes out all your electronics. Or perhaps there simply isn't time to use your electronics (or a mistake has

Help



Islands and reefs interact with the wave and swell pattern as well as the currents in the vicinity. This causes changes in waves and swell, a sure indicator that something is nearby.

In the left drawing you can see how the swell both wraps around the corner of the depicted lagoon, but also creates a smooth spot to leeward. On the windward side (top) the seas will reflect back to weather several miles, disturbing the normal wave pattern. If a large surf is breaking the reef, it will be visible for several miles, even on a squally night.

been made interpreting the GPS) and your "feel" for the situation becomes of paramount importance.

Besides, it's fun to practice the same skills that were used in the olden days. We are perpetually watching for the signs and trying to read the sea; then we make our own analysis before consulting the electronics to confirm or reject what our senses tell us.

Spend some time practicing without electronics, and you will be surprised how much more interesting passages will become.

Smoothed Seas

If approaching a weather shore, and a sea is running, there will be a noticeable calming effect as you close with the land.

If the land is high, the odds are the wind pattern will change significantly as well. These changes can be anything from a drop in velocity due to a blocking mountain range, to a major directional shift (usually parallel to the shoreline). If you are approaching downwind of a valley or canyon you may find an increase in wind from a channeling effect.

Reflected Waves

When waves hit the shore some of their energy is reflected back to sea. This creates a smaller, fast-moving set of waves that will interact with the normal sea state.

This is particularly common when approaching a downwind shoreline, with large seas breaking on the surrounding reef or beach.

Remember, when you are running in towards land, any change in the sea state is cause for immediate investigation.

Crossing Patterns

Most of the time we are at sea we find swells and/or waves interacting from different directions. It may be a situation where there is a tradewind sea running from the northeast and a southerly swell coming up from some major storm in the Southern Ocean. If all of a sudden that southerly swell disappears, and you are in the vicinity of land, the odds are that the land is acting as a breakwater.

When you are approaching reefs and smaller islands from leeward, often the existing wave and swell systems will wrap around the obstruction. These wrapping waves come together as much as five or 10 miles to leeward, and are very noticeable as they interact with the normal tradewind seas.

Stock Newport

Current Variation

The same thing can happen with currents as we've discussed in the preceding section. Obstructions change current direction and velocity. Also, tidal currents may become more of a factor as you near land. When the current direction and speed change, this affects your wave systems. These changes are usually felt quickly, rather than over long periods of time.

Debris

Debris is another indicator of land. Sometimes it's natural debris, taking the form of trees, brush, and grasses which have washed down a local river. At other times the appearance of trash is a signal that you are nearing civilization.

Bird Life

Birds have been used for centuries by seafarers as indicators of nearby land. Noddies and white terns can typically be found at 20 miles or so offshore. Brown boobies fly a bit further offshore, usually 30 miles or so. Red-and blue-footed boobies will be seen 50 and sometimes more miles from land.

Frigate birds are generally sighted within 50 miles of their breeding grounds, although they can be found as far as 150 miles from home. (For a much more detailed discussion of this subject see *We the Navigators* by David Lewis.)

Hearing

The roar of surf breaking on a reef can be heard for miles if it is quiet out. This is very easy to detect when sailing in light airs. But if it is blowing hard, it will be difficult to hear over ambient wind and wave noise.

Likewise, the use of your engine will mask the sound of a breaking reef. If you are powering in light airs and are unsure of your position, it makes sense to shut the engine down periodically and have a good listen.

Sound waves carry on the wind so when you are approaching from the leeward you will hear the reef break much further off than if you are to weather.

Smell

You can smell land ten miles or more away if you are downwind. Wood smoke, vegetation decay, and tropical flowers all give signals of what to expect and—to some degree—when to expect it, as the odor gets exponentially stronger with your proximity to land.

Temperature

Abrupt changes in air temperature are another sign that you are closing with the shore. At night there is a flow of the cooler land breeze down over the warmer ocean. This is particularly pronounced at the mouth of a valley.

Clouds

The green of shallow reef water reflects on the underside of cumulous clouds and is an indicator of a lagoon hours before the reef itself can be seen.

The higher your viewpoint, the better you can make out land features. Sarah and Elyse started conning us in coral early in life. Here, they are watching the edges of the entrance to Papeete, Tahiti.

In the same context, it is not unusual to find a build-up of cumulus clouds over shallow water areas. The warmer water trapped in these areas helps the cumulus clouds to grow larger than the surrounding clouds over the deeper, cooler water.

If the land you are approaching is high, it is quite normal to sight cloud build-ups on the mountaintops well before you can see the land itself.

The Loom of Lights

The loom of city lights on the underside of high clouds can be seen at 30 or more miles if the cloud base is high enough. In fact, that loom can be so bright that it makes it difficult to see foreground obstacles.

If your chart indicates that civilization is some distance inland, then you need to be very careful with obstacles along the shore, as they will be hard to see when backlit.

Lighthouses are also difficult to pick out against the lights of civilization, as are buoys and the running lights of other vessels.

Piloting in Fog

Fog creates several sets of problems. First, visibility is reduced, sometimes to barely the bow of the boat. Under some conditions sound will be modified (made louder, softer, or seem like it is coming from a different

Stock Newport

Help

direction). And, with no horizon, you can get spatially disoriented.

Navigation Issues

Disorientation in fog makes it necessary to keep a close navigation plot. A paper plot, together with a detailed log, can get you re-oriented. Even with GPS, maintaining a paper plot helps enormously.

In addition, it is helpful to maintain a record of the course being steered, speed, more frequent log readings, and a record of each navigational waypoint written up. None of this is unusual, except for a closer spacing of log intervals and more detailed recordkeeping.

Looking forward into a moderately heavy fog. This is a mid-morning photo, heading east, so the sun is behind us on the port side. We could actually see objects behind us better than ahead. At this point visibility was about 200-feet (60-meters) ahead.

Picking the Right Speed

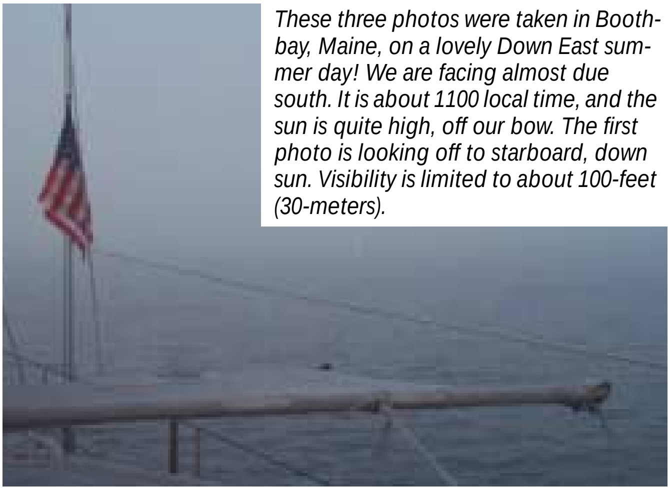
Although modern nav aids like radar and electronic chart plotters coupled with the GPS make navigation far simpler, you still have to think about other boats and obstructions. Even with the best quality radar, with a sea running smaller vessels close to your position will be lost in sea clutter.

So if you are piloting in fog in areas likely to have traffic, the rule is to slow down enough so that you can stop the boat within distance that you can see.

Keeping Watch

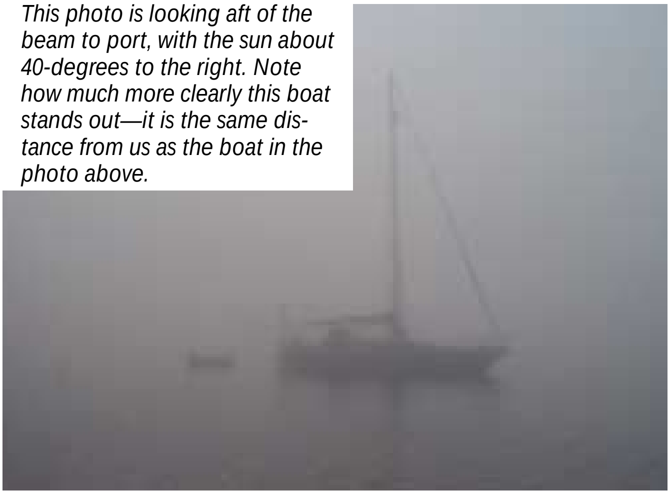
If the primary watchstander is focusing only on the radar and/or chart plotter, he or she cannot watch for those vessels that might not show up on radar. That's like driving down the freeway by watching the lane markers rather than traffic. If there's no traffic, fine. Otherwise one crewmember needs to also keep a constant eye on deck.

By definition, if it is foggy it will also be damp and chilly. Yet to keep a good watch someone needs to stay outside, where his or her ears as well as eyes are at their most sensitive (if you wear glasses, keep plenty of dry towels handy for wiping off precipitation).



These three photos were taken in Boothbay, Maine, on a lovely Down East summer day! We are facing almost due south. It is about 1100 local time, and the sun is quite high, off our bow. The first photo is looking off to starboard, down sun. Visibility is limited to about 100-feet (30-meters).

This image is looking just ahead of the port beam, and directly into the sun. The boat, which you can barely make out, is about 150-feet (45-meters) away. The actual image would appear and then disappear, as the fog thickened and then thinned from time to time.



This photo is looking aft of the beam to port, with the sun about 40-degrees to the right. Note how much more clearly this boat stands out—it is the same distance from us as the boat in the photo above.

A couple of other issues to consider: it is important to watch out behind and to the side as well as ahead. In addition, if you stop to get your bearings, keep an even closer eye behind you. There may be someone tracking you on radar, on the same path, who does not realize that you've stopped.

Viewing Angles vs. the Sun

Our experience is that you can often see objects outlined or highlighted by the sun when the object you are looking at (or for) is at an angle between your position and the sun. If headed west in the afternoon, this means objects below or above the position of the sun will be more visible than if the sun were in the east.

However, we've noticed that in some conditions objects that are directly in line with the sun are sometimes difficult to pick out.

This may vary with the thickness of the fog, time of day, and if there is any high cloud between the sun and the low lying fog.

Making Yourself More Visible

Aside from carrying a large radar reflector, you can also increase visibility by leaving on running lights. At anchor, leaving on the spreader lights will definitely make you more visible to other vessels.

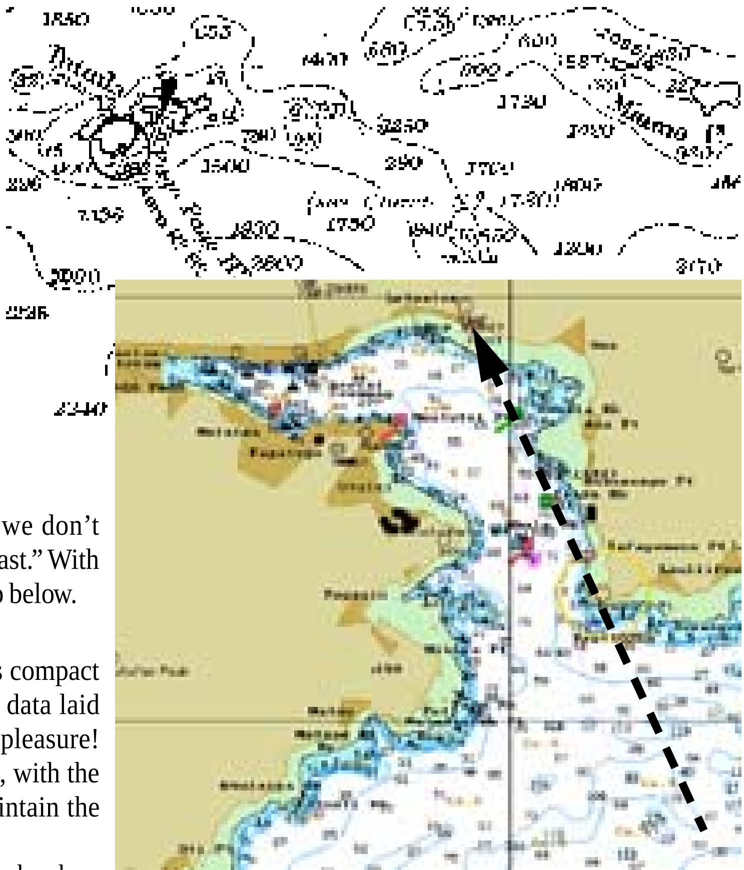
Entering Harbors at Night

A waning moon outlines the mountaintops of American Samoa as *Intermezzo* reaches towards Pago Pago. We have been at sea for three bouncy but fast days since leaving Suvorov Atoll in the Northern Cook Islands. An "American" port lays ahead. Skippy peanut butter, real hamburgers, mayonnaise, and other delicacies await.

At 2330 faint loom from the city is visible on the underside of the cloud cover. With our big reacher and a full main both drawing, we are clipping along at just under 8-knots in the Force 4 to 5 south-easterly tradewinds. In another couple of hours we will be there.

"Honey, why don't you come up for a few minutes so I can have another look at the pilot and charts." A minute later Linda arrives on deck, festooned in her standard dog watch outfit of nightgown, yellow slicker, and safety harness.

"I haven't seen any traffic. We're about 10 miles offshore, and the breeze seems to be holding. Don't worry about the compass course. Head for the center of the lights. Just make sure we don't close with the land too fast." With that last comment I drop below.



Transas Chart

Check out the entrance to Pago Pago on the chart above. The entrance is actually quite straightforward, and there are range lights. But if you get confused, and make an error, or if the range lights are not working, you will be on the reef before you have time to change course! The dashed line indicates the position of Intermezzo when we thought we had the ranges on shore correctly aligned.

Lay of the Land

Sitting at *Intermezzo*'s compact nav station, I study the data laid out before me. What a pleasure! US charts of US waters, with the US Coast Guard to maintain the aids to navigation.

It appears that the harbor entrance is distinguished by a set of range lights, several buoys marking a reef we will pass to port, and a light on a rock promontory at the starboard side of the harbor.

Entry shouldn't be too bad, I think. Once we're through the entrance there will be a turn to port with a large deep harbor, mostly clear of obstructions, in which to drop the hook. After a last look at the chart I turn and head back up the companionway.

"How does it look?" Linda asks.

"Shouldn't be too bad," I reply. "I think we might even go in tonight. The chart is detailed, there are range lights, it's a commercial harbor, and we are back in US waters."

Linda is appalled by my suggestion. "I thought we had a rule about strange harbors after dark?"

She did have a point. It has always been our hard, fast rule *never* to venture into a new (first-time visited) harbor after dark. My dad taught me this tenet of seamanship, and for the sake of a few hours of being hove to, I am preparing to break this sacrosanct rule.

"Well, let's see how things look when we get there," I reply.

Time passes almost as quickly as the trade-wind seas lifting our stern. By 0245 we are directly upwind of Pago harbor, 2 1/2 miles to leeward. The seas are running 10- to 12-feet and becoming disturbed from reflected waves bouncing off the shoreline. To heave to until daylight will be most uncomfortable.

Slowing Down for the Approach

We reef the main, douse the reacher, and set our small jib, and work in slowly toward the land. Slightly to starboard I can see the first range light, a white flasher. In another few minutes I pick up the second range light. The compass angle looks about right from where we stand. To starboard the entrance light beams away in its preset cadence.

"Sure looks easy," I say.

"Let's wait," is Linda's reply. "It will be light in another couple of hours. Why take a chance? Once we are hove to I'll warm some hot chocolate. We can make a batch of popcorn and I'll stay up and help you eat it."

That is an offer I find hard to refuse. We turn our head upwind, put the jib away, and set the small staysail. Once the jib is rolled away our motion quiets, and I put the helm over. *Intermezzo* heaves to neatly with the staysail aback. Hot chocolate time!

At First Light

By 0530 the sky has begun to lighten to the point where visibility is rapidly improving. The mountains to starboard are sharply defined, and we can see the reef breaking to port. We bear off under reduced sail and work toward the harbor mouth.

In the first light of day the navigational lights are still visible. As we work our way up to windward the "range lights" hove into alignment. What I had planned to lead us safely into the harbor is a combination of a warehouse light ashore and the lighted buoy at the end of the reef! With the sea that is running *Intermezzo* would have been shredded fiberglass in minutes had we adopted that approach.

Relieved that Linda had forestalled such a rash act, I am yet irritated with the US Coast Guard. After all, our tax dollars are paying for proper maintenance. Once we have tied up at the immigration dock, I hail the first man in uniform I find and advise him that the range lights aren't working.

"Well, I guess they haven't gotten around to fixing them yet," is the reply. "Last week somebody mentioned it, too." (Six weeks later when we leave American Samoa the range lights still are inoperative.)

That experience strengthened our resolve never again to consider entering a strange harbor at night, even in continental waters. We might go in if I'd had a good look in daylight, but we'd never go in someplace we'd seen only in the dark.

If It's the Lesser of Two Evils

There may be times when it seems the lesser of two evils to seek a new harbor in the dark. Perhaps your cruising area is so reef-strewn and position-finding is so unreliable that the risks of standing off are greater than those of trying to make an entrance. Weather may be deteriorating, or a medical emergency may force your hand.

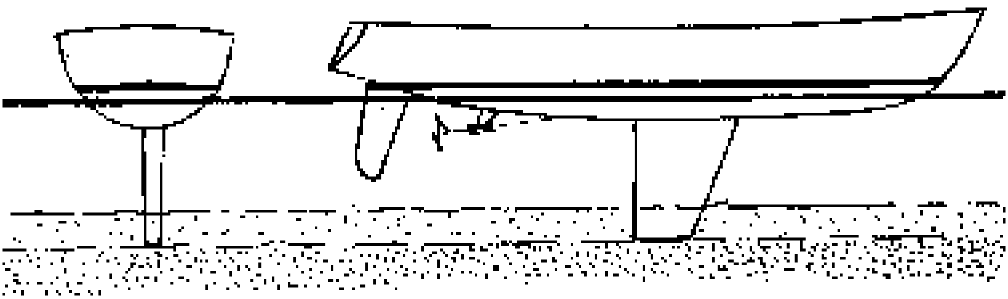
In weighing the alternatives you have to consider a number of aspects. First, what type of charts and pilot data do you have available? How accurate are they likely to be? Are there aids to navigation to be relied upon? To verify the information you have it is best to try to contact a local cruiser via radio. If the cruiser is in the harbor he or she will be able to advise you of the best approach and may be able to talk you in. Be sure to ask also about uncharted dangers, such as a vessel that may have recently gone to the bottom in the entrance.

What if You Strand?

You also have to weigh the dangers of inadvertently becoming stranded. Is the sea running or likely to make up? How about bottom condition? A mud bottom will be less likely to damage your vessel than rock or coral. Take into account the state of tides. A rising tide gives you some small room for error. If it is dropping you will have little chance to correct mistakes.

The shape of your keel and the bottom type affect risks when stranded. Soft mud and a high aspect fin keel get along well. You can often shove the keel through several feet of mud. On the other hand, any sort of bulb or wing at the keel bottom acts as an anchor and increases the risk of a mistake significantly.

Mud, sand, and shells accept a stranded hull easily. But coral and rocks may point load the fins or hull and create high concentrations of stress.



Help

You also must take into account the characteristics of your vessel. If she is stoutly built, hopefully of metal, she will be able to take more punishment, for longer, if she grounds. Wood or ferrocement vessels have little tolerance for error.

Reading Shore Lights

As the preceding story shows, one has to indeed be careful when interpreting navigation or shore lights. Since navigation lights usually have different flashing and/or color characteristics, in theory they should be easy to discern from non-navigation lights ashore.

However, it is easy to make a a mistake, especially when your adrenaline is pumping.

Another problem to watch when approaching remote shores are lights which are high up giving a false sense of security (if it is high it's easy to think the light must be a long way away when it is really right on a cliff close to the shore).

Approach to Port Sandwich

We had just this sorts of Hobson's choice during a passage we made in the New Hebrides Islands (now the nation of Vanuatu).

Having left Havana Harbor on the island of Efate at sunrise we are now motorsailing northwest toward a reportedly beautiful anchorage on the northwest corner of Epi Island.

The quantity and variety of islets and volcanic cones dotting the horizon amaze us all. On the chart many bear the notation "active volcano", and a large area bears the warning "Caution, underwater volcanic activity." It appears that the hydrographers can't keep up with nature.

As the day wears on, a gentle swell begins to roll in from the southwest.

This rather dark photo was taken towards the end of daylight, as we were motorsailing towards Port Sandwich. As you can see, it is overcast, eliminating any chance to see what is below the surface of the ocean.

Off to starboard—to the east—Ambryn Island and its active volcano is smoking away. At night we would sometimes be treated to spectacular pyrotechnic displays.

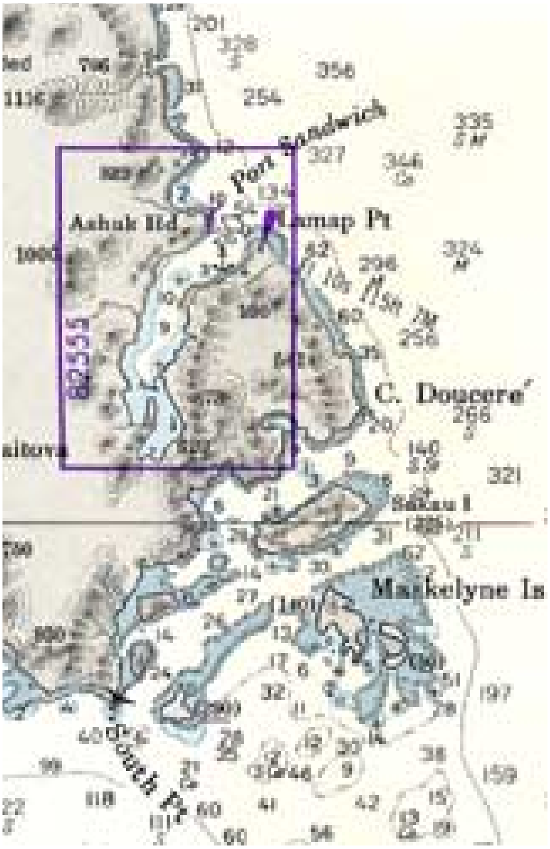
Help

The swell itself doesn't concern us, but as a precursor of worse to come it does; we fear our proposed anchorage may become a lee shore. We are caught in a difficult situation. There is no fully protected harbor that we know we can reach safely in daylight. Havana is too far behind to return to. It appears that Port Sandwich, on the southeast corner of Malekula Island is our best bet.

We set every stitch of sail *Intermezzo* can carry as we race the sun. A bit of afternoon breeze fills in to help us on our way. If we are lucky, we may just make it.

Two hours later and the breeze begins to lighten—we are reduced to diesel power again. Linda and I confer; to stand offshore at night, in poorly charted waters strewn with reefs not marked by any navigation aids and possibly containing a new volcano or two seems even more dangerous than trying our luck at the new harbor. We decide to go for it.

On the ham radio we raise the Hasts aboard the schooner *Sunday Morning* in Port Sandwich. They inform us that the entrance is just as it looks on the chart, deep down the center; steep-to on the starboard side, with reef out about 300-feet (100-meters) from shore to port. The chart indicates a gradual shoaling from 20 fathoms to 8 some distance from the reef. Linda and I decide to enter with the radar and depthfinder and then use our eyes and depthfinder to work our way inside to an anchorage.



The approach to Port Sandwich looks pretty straightforward on this chart. But by this point in our voyaging we'd become pretty wary of printed data. If we'd not been able to verify the chart details with the Hasts, already anchored there, we probably would have taken our chances and hove to until daylight.

Heading In With Depthsounder and Radar

We head in, and Linda calls the depthfinder readings. As long as we have more than 20 fathoms under our bottom we will be okay. The entrance presents a good radar target, and we favor the starboard side away from the reef.

With the starboard entrance now abeam, Linda heads slightly to port. I go forward to watch for any disturbance in the water that indicates shallow depths ahead. As the bottom shoals Linda calls off the numbers, "Fifteen, twelve, ten, ten, eight. Back down hard," is my reply, and *Intermezzo* slowly comes to a halt. We will anchor in deep water tonight. This is close enough to the reef. In the morning we will move to the inner recess of the harbor.

Help

Eyeball Navigation

With a bit of height, some ripple on the water from breeze, and the sun behind you, eyeball navigation in the tropics is not difficult.

Nothing strikes fear into the heart of a newcomer to cruising like piloting in coral. Stories of the horrors of Tuamotuan passes abound, and the droll comments of the Admiralty or US pilot don't do much to instill confidence. And yet, given proper preparation, evaluation of the factors involved, and a little help from the weather, the risks can be minimized.

To begin with, you need to study whatever data is available about the area to be traversed. Pilots and charts help, but that data will be at best marginally accurate. They can be relied on for a general lay of the area, but nothing further. Recent picture postcards, especially aerial photos, are a much better source of information as they usually show passes and fringing reef in great detail.

Then, your vessel's capabilities must be considered. How handy is she under power? What's her turning ability? How fast will she stop? Should the engine fail, can you sail her out of a tight spot? How about construction? Steel, aluminum, heavy solid fiberglass all have a much higher tolerance for damage than wood or cement.

Next factor to think about is weather. Is it settled? Can you expect good sunlight and visibility? What about the time required to traverse the area? A short passage isn't a problem, but longer passages through coral may mean that a stop is inevitable due to loss of sun angle.

Equipment

Eyeball navigation requires proper equipment and preparation as well. Polarized sunglasses are a must. The polarizing action filters out much of the reflected glare from the surface, making it easier to see underwater obstructions. On board should be lightly shaded glasses for partially overcast days, and heavily tinted ones for bright, cloudless days.

Since you'll be spending a lot of time aloft (hours in some cases), a comfortable perch is required—one that can be maintained in a seaway. The higher you are, the better you'll be able to see out in front. It's best to have a perch on the upper spreaders (small boat) or lower spreaders (big boat) that can be used in calm water. For bouncy conditions, steps or ratlines lashed to fore- and aft-lower shrouds are best.

Wear a good shade hat or, better yet, a sun visor. Sun visors tend to stay put in a breeze, whereas a full or floppy hat may require a helping hand.

There will be times when you want a chart aloft too, and for this purpose nothing works better than an old-fashioned clipboard. The chart can be folded until the section needed is exposed. Attach a snapshackle and line to the clipboard, so it can be hooked to a ring in the rigging or on the mast. This frees your hands when you are not consulting the chart. Working with binoculars aloft while wearing polarized sunglasses isn't easy but is essential on occasion, so have good straps on both.

Visibility Factors

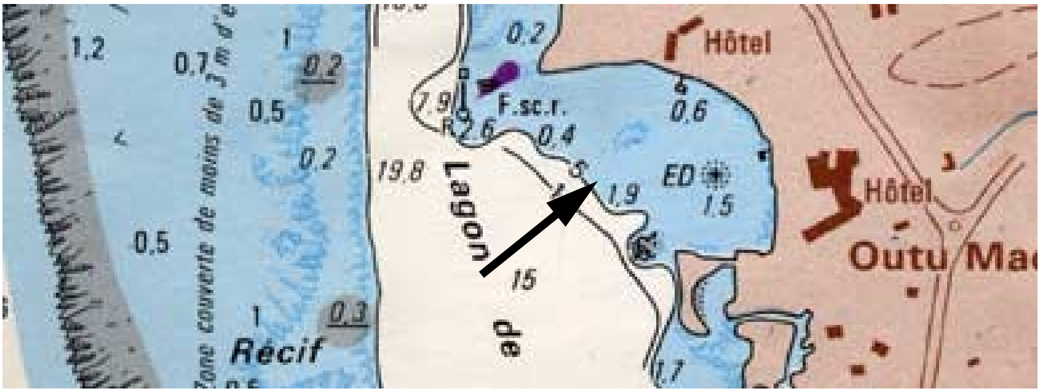
With your equipment ready and the vessel's capabilities considered, let's review those visibility factors which aren't under our control.

Foremost is water clarity. In certain lagoons you can see a shackle on the anchor in 60-feet (18-meters) of water, while in others you can't see the bottom in 10-feet (3-meters).

If you're working in coral associated with a high island after a heavy rainfall, beware the runoff from the rain will muddy the water. On occasion it can take several days or more for visibility to improve. Another factor to clarity is man-made activity. Blasting, dredging, or dumping can all have substantial and lasting effects. We learned about this in Maeva Bay just south of Papeete.

20 years later and the water in Maeva Beach is still murky. The chart below gives an outline of the indentation on the right side, with the channel through the coral clearly shown, as is the barrier reef all the way on the left. Depths are in meters.

There is actually quite a large area in which you can anchor, free of coral. But you have to eyeball your way in and out.



Help

Coral planning:

- ❑ How early can you leave and still be able to see ahead?
- ❑ At what point will the sun go ahead to where you can no longer see forward?
- ❑ Do you expect some wind to texture the water?
- ❑ Are cloud shadows going to be a problem?
- ❑ Do reefs show up at high tide?
- ❑ Is there an intermediate anchorage to fall back on in case the primary anchorage cannot be reached?

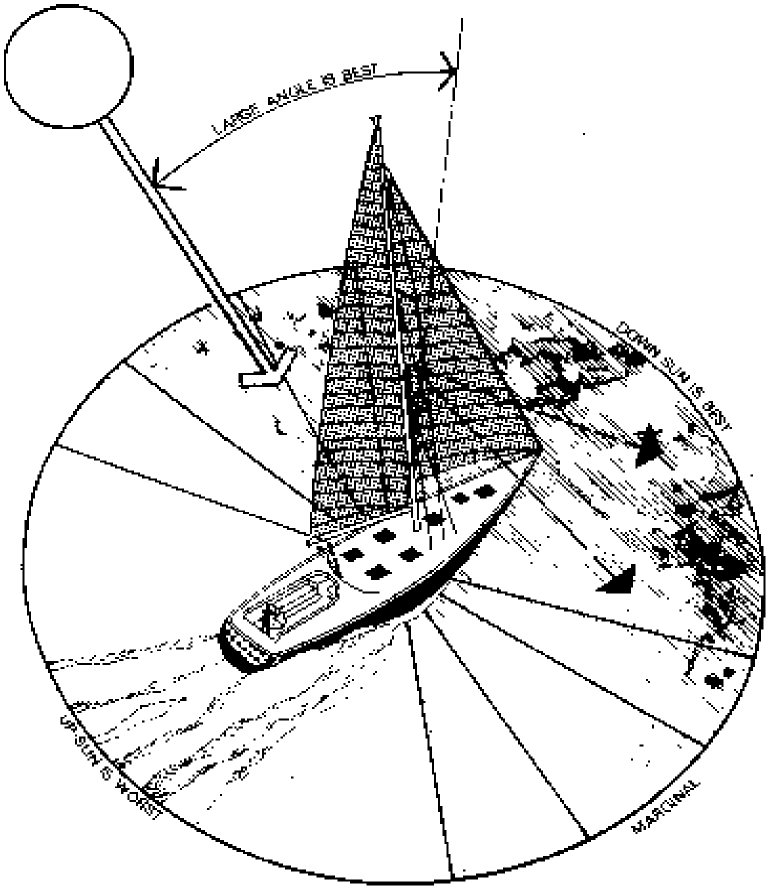
We had come down inside the lagoon from Papeete, looking for a quiet anchorage, and the indentation in front of the Maeva Beach Hotel looked like just the spot. However, the construction of a small marina had disturbed the water.

Linda was keeping a lookout from the bow pulpit, and didn't realize that the water was shoaling since its color stayed dark. Then there was a thud; our stern rose abruptly out of the water; and, as you can imagine, there were a few inquiries from the cockpit as to what was going on forward. Subsequently we stayed completely out of anything but clear water if coral was about.

Sun Angle

The best visibility is with the sun moderately high and over your shoulder. The sun's declination (its position relative to the equator) must be considered as well.

If the sun is on your latitude in the morning, you'll be able to see well to the west, with the sunlight beaming from the east, and the reverse in the afternoon.



Visibility to the west will be best about 2 1/2 hours after sunrise until an hour before the sun is directly overhead. Very low sun angles can be used, but they're good only for narrow directions of viewing.

The question of visibility is a little more complicated when the sun is north or south of your position. If the sun is north of you 15-degrees or so, you'll have good visibility to the south; the opposite is true if the sun is to your south. If you're making a short journey, you can pick the optimum time to transit based on proper sun position during the day. But on a longer trek you'll have to figure out ahead of time where the sun will be at any time and factor in any course changes that will affect your viewing angle.

Other factors to consider when making longer journeys are the reliability of your speed under sail or power, and the possibility of intermediate stopping points should a delay occur or visibility be lost.

Weather Issues

If it's absolutely calm and the water surface is glassy, it will be difficult to see below the surface, even at good sun angles. Fortunately, this is a rare situation, and a slight rippling of the surface will give you the necessary clarity.

Even worse than glassy calm is an overcast sky which will make it virtually impossible to see what lurks below. We're fortunate in that most coral cruising areas are blessed with clear skies, but some regions, such as Fiji and New Caledonia, can be overcast for long periods. In this case you have no choice but to stay put, although in a metal boat there's more margin for error than with others. If you've been over the route before, the voyage may be safer.

It is usually not a good idea to depend on channel markers to show the way, since they're frequently misplaced, missing, or confusing.

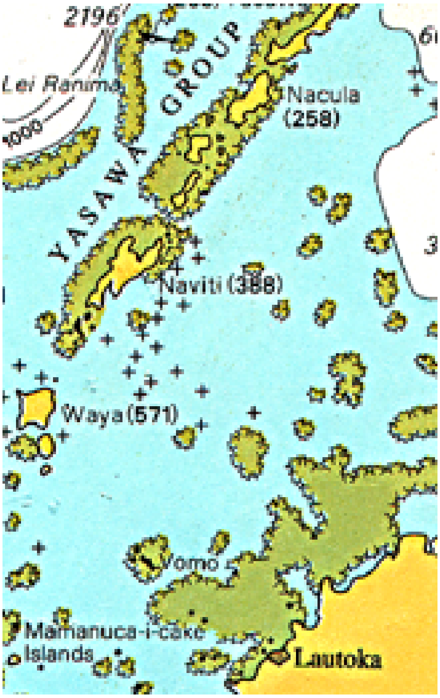
Looking down-sun towards a coralhead on a slightly overcast day. As long as there is some breeze to ripple the surface of the water, you can see most of what lurks beneath. The marker on the corner of the coralhead just shows you where one corner is. Generally, it is better not to rely on markers.

Below, early in the morning, with a low sun behind. The wind is calm and the water smooth. All you can see here is the outline of reef areas which are nearly awash. However, heads located below the surface will not show up in these conditions.

The state of the tide is very important. In some areas low tide will show some reef, making it easier to spot. The worst situation is a high tide covering the reef, coupled with a lack of sea action. This combination will hide a reef which at low tide might have been visible, even in overcast.

Help

The photo below was taken en route to the Blue Lagoon area of Fiji, in the Yasawa Islands. The sun is about two hours from being directly overhead and to the northeast (right) of the photo (arrow). Not in its best position, but as you can see here, if it is over the right shoulder there is still good visibility to the left. As the view swings more clockwise, to the right, the visibility deteriorates as the angle to the sun is reduced.



We were traveling from Lautoka at the southeast corner of this chart to the Yasawas to the north. A detail chart of the first leg of this passage is on the opposite page.

Towards Blue Lagoon

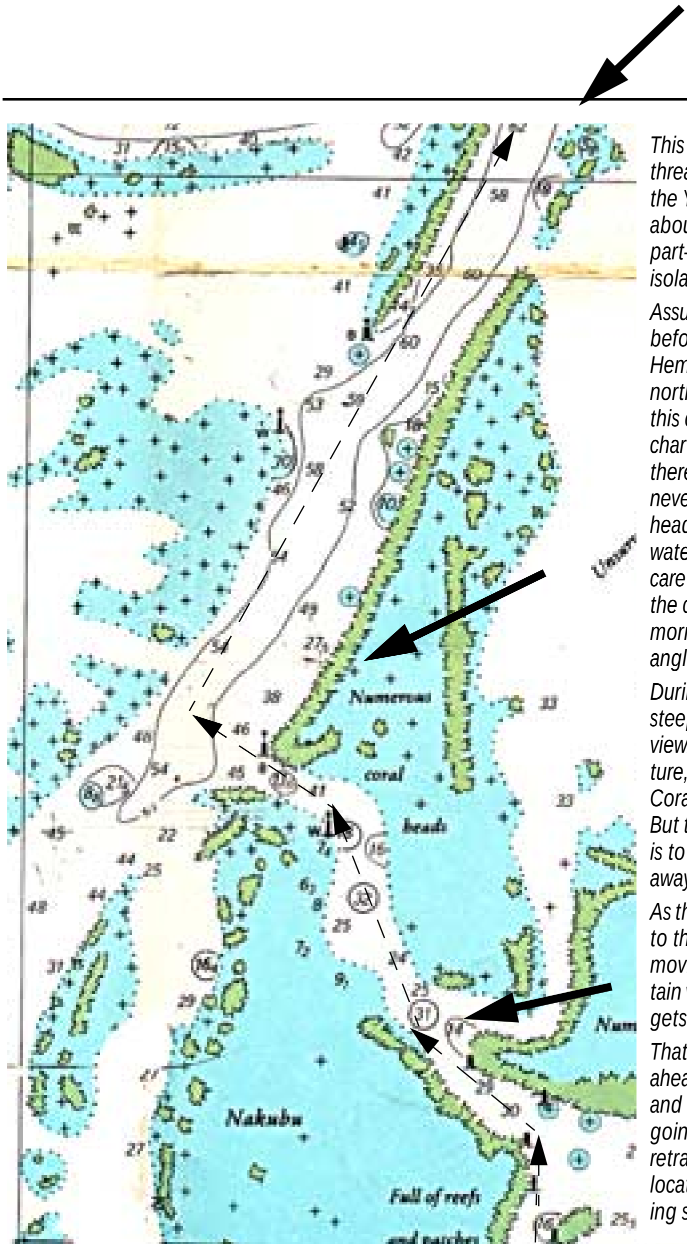
The most difficult passage we experienced in coral took place on the back side of Viti Levu in Fijian waters, when we wanted to go from Lautoka to the Blue Lagoon area of the Yasawa Islands.

Moving north, away from Lautoka, the water cleared until we found the channel markers indicating our left-hand turn to the west. For the next three hours we wound our way through deep channels, well defined with steep-to coral. Toward noon we started to search for a good place to anchor for the night.

With the sun 30-degrees to our north, we figured good visibility until 1400. Time droned on and still no anchorage appeared. There had to be one somewhere, we reasoned, but no luck.

At 1415 it appeared as if someone had pulled a switch—we could no longer see ahead. We turned *Intermezzo* around and backtracked toward Lautoka at full speed, racing the sunset for visibility.

The next day, being familiar with the early segments of the route, we left at daybreak, spending three hours inside the reefs before the sun had climbed to give us good visibility. This head start made it possible to make the Blue Lagoon Islands in one shot.



This chart gives an idea of the coral we had to thread through between Lautoka, Fiji, and the Yasawa Islands to the north. This covers about one-third of the voyage, the worst part—but after this area there are still lots of isolated coral patches to be avoided.

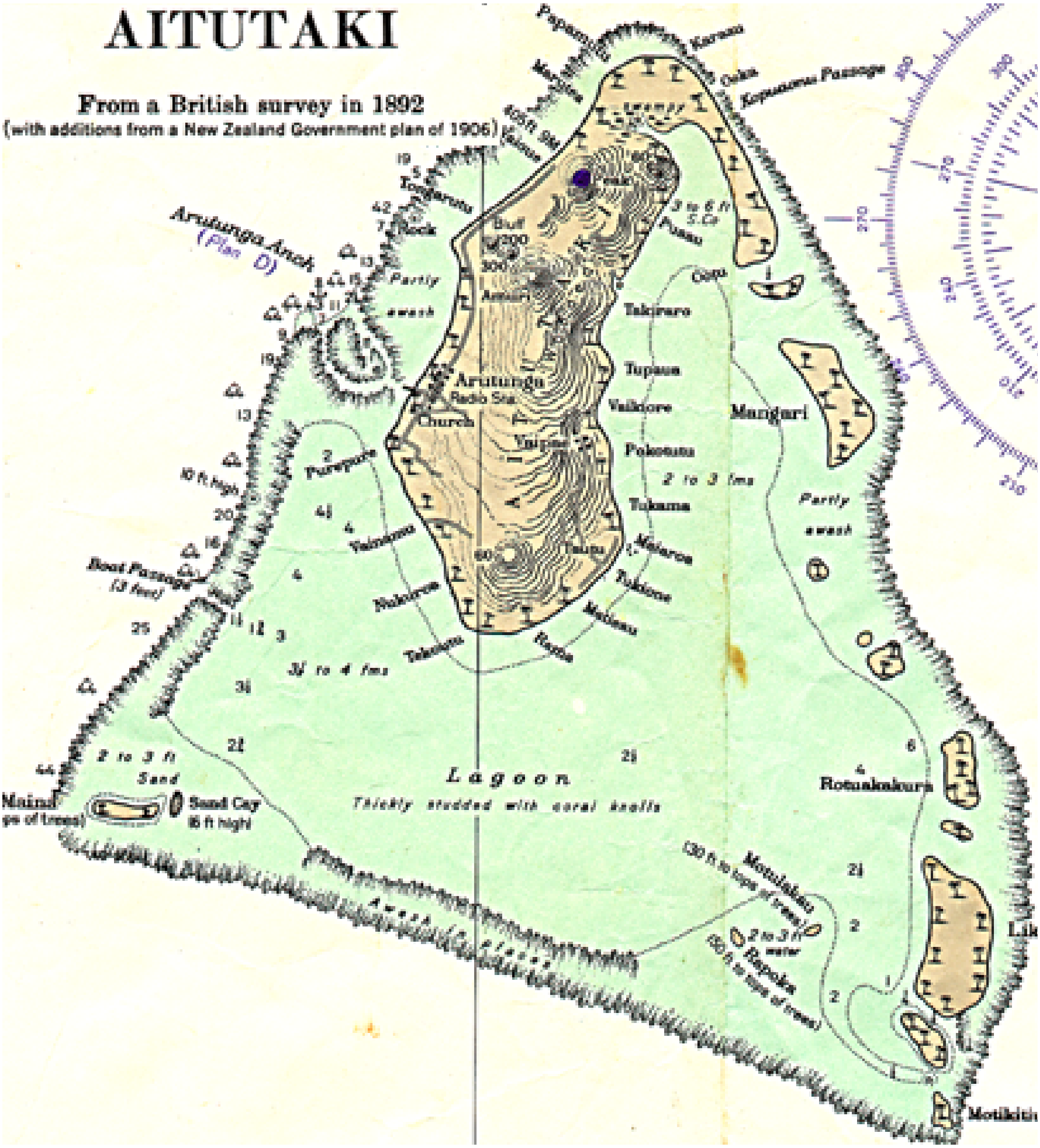
Assume you are studying this chart the night before you are due to leave. It is Southern Hemisphere winter, which means the sun is north of the equator (north is at the top of this chart). Although buoys are shown (this chart is from our 1995 trip through Fiji) in 1977 there were none. With the sun north there are never going to be any really good sun angles heading north, but...if the breeze ruffles the water, and if overcast is not a problem, with care you will be able to discern the edges of the coral on the side—at least during the morning hours. (The solid arrows indicate sun angle during the trip)

During the initial part of the trip the coral is steep-to for the most part, relatively easy to view. This allows for an early morning departure, which has the sun low in the east (right). Coral on the east side (right) will be invisible. But to port it will be clearly outlined. The key is to keep to the port side of the channel, away from hidden obstructions on the right.

As the trip goes on, the course bends around to the northeast, at the same time the sun is moving. If you are fast enough, you can maintain viewing angle with the sun. But if the sun gets ahead, at some point you lose visibility.

That's what happened to us. The sun got ahead of us, after we'd left these channels, and we were no longer able to see what was going on. But when we turned around to retrace out steps the sun was in the perfect location for excellent visibility (with us heading south).

Help



Aitutaki, in the Northern Cook Islands, is located between Tonga and the Societies in French Polynesia. The people are wonderful, the water clear, and it has been a favorite stopping place for adventurous cruisers for decades. However, there are a number of difficulties with approaching the island.

To begin with, the normal direction of approach is from the east. Making landfall in the morning hours, the sun is behind you and the reefs will be revealed in all their glory. But if closure is made in the afternoon, the sun is in the west, in your eyes, and the reefs will be hidden except for breaking seas. On the other hand, the pass (very shallow) and anchorage (an open roadstead) are on the west side, so you need afternoon sun to feel your way in.

With arrival in the morning (the best bet) the ideal is to proceed slowly around the island, keep well off the reefs exposed to the west until mid-afternoon, after which the sun will be behind you as you face east towards the reefs. With an afternoon arrival maintain a large distance off the east side of the island (with the visually obscured reefs).

Help

Interpreting Cloud Shadow

Between the two extremes of pure sunlight and overcast are the occasional clouds that can be disconcerting as they cast shadows over the bottom. In many cases these shadows look just like coralheads.

Experience, as always, is the best teacher. After awhile you'll be able to tell which is which.

Bottom and Coral Formation

One of the factors to be considered is the type of coral and bottom conditions you'll be working with.

In most areas you'll have a hard bottom with a thin layer of sand at a pretty constant depth. Up from this will rise coralheads with perpendicular sides. These configurations are the easiest for navigating. The contour of the coral is usually even; jutting fingers with small isolated heads are uncommon. Water will be deep, right up to the edge of the coral. The top of the coral will be covered with a small amount of water at low tide, or perhaps slightly awash. If contact is made, it's usually not serious.

Much more dangerous for navigation are uneven bottoms with "bombies." Here you may have a bottom that rises and falls, and on occasion may be just below the surface, lurking at the perfect height to snag you. When piloting in these conditions, the most favorable viewing conditions are obviously required.

Determining Water Depth

You'll learn to discern water depth by the play of colors. Dark blue means security—deep water. As the water color lightens but stays in the light blue range, you still have plenty of depth to work with. When the white starts coming up, it's time to keep a close watch and slow down. Yellows, browns, and purple are definite bottom crunchers.

As we mentioned before, you should always know the state of the tide during a passage. If visibility turns poor and you have low tide coupled with a bit of sea, you'll generally be able to tell the location of the coralheads by surface disturbances and wave patterns. A swift current in a pass will also show their location by eddies and swirls.

Above, the sun has moved slightly ahead and to the right. Visibility on the port side is still okay. But to starboard, nothing is showing. Also, any coralheads directly in front of us which are under more than 3-feet (1-meter) of water are going to be tough to spot.

When caught like this, the trick is to find a clear path you can follow by watching the reef on the side which is viewable (in this case starboard), staying well clear of anything which may lurk on the opposite side of the channel.

Often there are typical characteristics to the coralheads and reefs within a given lagoon or area of a lagoon. By checking this out carefully when visibility is good, it will help you to know what to do when conditions deteriorate.

The photo above is taken in the lagoon at Ahe, in the Tuamotus, French Polynesia. The inside edges of the barrier reef are quite broken and patchy, as you can see in this foreground (we're anchored in a small cul de sac of coral). When you look across this foul area to the balance of the lagoon it is quite open. There are many large heads, but these are generally steep-sided and very close to the surface.

The photo below is from Nissan Island at the northeast corner of the Solomons, in the Western South Pacific. This was quite clear 25 years ago and the barrier reef steep-to.

Coral Passes

Many passes are sharply defined with vertical, smooth walls of coral on each side. That is the case with Takaroa shown above, in the Tuamoutus. The main issue here is the current, which at time runs out the pass at six or more knots.

Sundeer is moored to the copra wharf on our second visit here.

Passes through barrier reefs are a different story. To begin with, the data shown in the pilots and charts are liable to be more accurate if the pass in question is in use commercially.

Most passes are steep-to along their edges, since the action of the current causes the coral to grow in wall-like structures. The entrance to the pass may also be well-marked.

Current

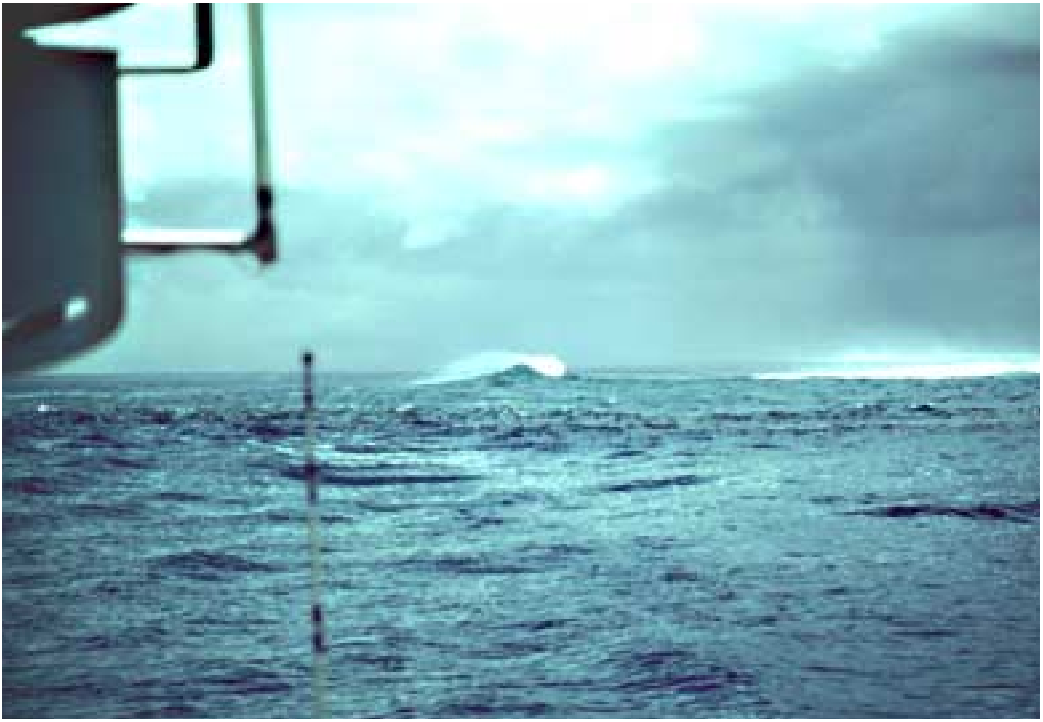
You may encounter various degrees of current at the mouth, depending on the sea state.

A large lagoon with miles of reef and one or two outlets can generate tremendous ebbing currents in a running sea. The waves breaking on the outer reef pour huge quantities of water into the lagoon and this must find its way out at the passes.

Only once, however, have we found it difficult to enter a pass, and that was at Suvorov after 3 1/2 days of gale-strength winds. When we approached the entrance to the pass aboard *Intermezzo*, which fortunately was in a lee, the current was really boiling. At full throttle, with our storm staysail and double-reefed main drawing as well, it took us over an hour to beat through a quarter-mile pass.

It is always safer to passage against the current than with it. When you are against the flow you have the boat moving at a high rate of speed through the water, though not over the bottom.

This provides good flow over the rudder and good steering control. Just the opposite is true heading with the current. In this case boat speed through the water is low, making steering difficult, yet speed over the bottom is high, increasing risks if you misread the bottom.



Often you will find passes with breaking surf on one or both entrances. If visibility is not ideal, as is the case with this photo, it is better to wait or move on to another island. In this case, Bora Bora in the Society Islands of French Polynesia, the pass is wide and well marked.

Breaking Seas

If a substantial current is ebbing into an opposing sea, there will probably be surf breaking across the entrance to the pass. As the current changes to flood (if enough sea has been running it may continue to ebb until things calm down), the break will probably become manageable.

If your vessel is handy at surfing and if you've been through the pass before, it may be worth a try. But if it's your first time through, or you're not adept at running on a breaking sea, don't attempt it.

It is always better to await a turn in the tide so that the breaking sea drops off a bit, assuming you still have good light angles.

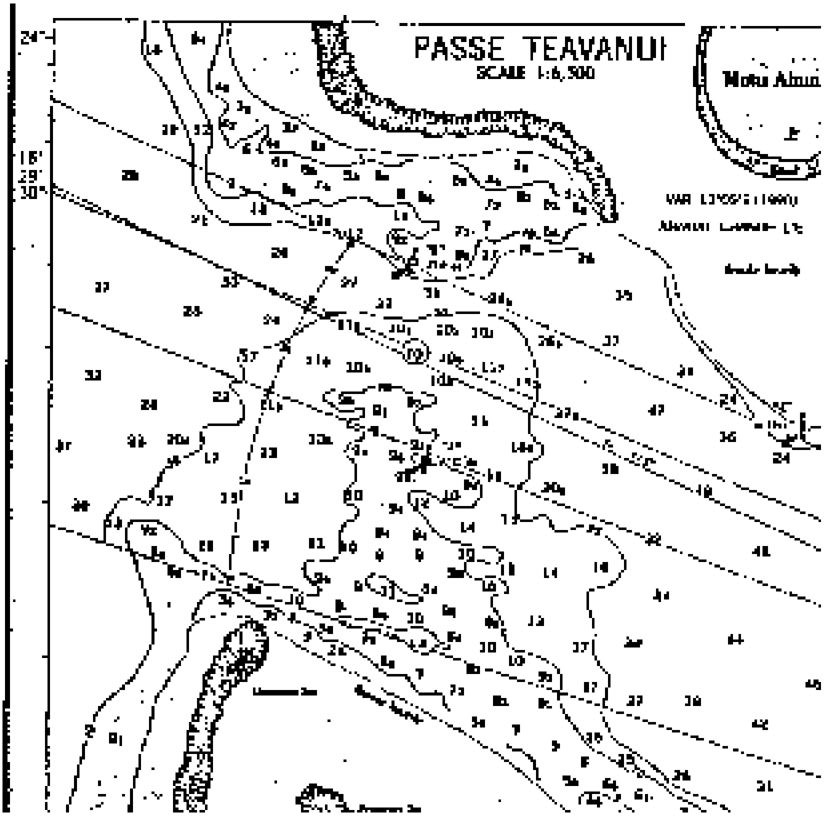
Downwind Passes

When there is a choice between an upwind entrance and one that forces you to run, it is usually best to use the upwind pass. You have better ability to turn around and/or stop if necessary when beating or close reaching than you do when running.

The worst combination is running before a strong breeze into an unfamiliar downwind pass, with less than ideal lighting.

Choice in Passes

It is not unusual to find several navigable entrance passes to a single lagoon. If this is the case it is usually best to pick the pass which has the smallest surf/least turbulence. This assumes that the visibility between the choices is comparable. Sun angle may favor one over another.



This is a detail of the pass into Bora Bora's lagoon. The photo on the opposite page is of the northwest corner (upper left side of photo).

Once you get past the corners, the entrance becomes very straightforward except for one issue. You are typically broad reaching into the pass at a pretty good clip. However, there are range markers and lights inshore, which is what the angled lines on the chart are telling us. And while you would not want to depend on these aids to navigation, if you know from someone already inside that they are accurate, they can be a real help.

Visibility is always the bottom line factor—if you can't see well enough to be safe, don't go. Select an alternate landfall, or heave to and wait until conditions improve.

Another issue to consider before making your choice of passes is what happens once you've passed the threshold and are into the lagoon?

Both the passage to your anchorage, and the sun angles required to get there with good visibilty need to be evaluated before you attempt the pass.

Inside the Pass

Once the threshold of the entrance has been crossed, passes are generally not hard to navigate. If you're fighting current, close to the sides (assuming they are steep-to) will have substantially less flow or even a countercurrent.

If the current is flooding and you're flying over the bottom, remember that you must maintain enough speed beyond that of the current to have good maneuverability.

In the event the wind is blowing across the pass, and it often does, work along the windward side, other factors allowing, just in case it should be necessary to sail your way out.

Help

Exiting (Downcurrent)

What can be actually trickier than entering while heading into a current is leaving with the flow. In this case you are rapidly moving over the bottom, but usually at a slow speed through the water, so rudder response is limited.

If whirlpools are about, you may not have enough boat speed through the current to keep on course.

Some passes have steep sides at their inner ends, like a sharply defined canyon. When this is the case, the current flow will be even and straight down the pass.

However, if the inner end of the pass flairs out, there will be a gradual reduction in water depth.

The strongest currents will be in the deepest part of the pass, but there can still be substantial flows over the shallower portions.

In the situation, you must have good visibility and stay aligned with the deepest part of the pass as you begin to enter the inner end heading towards the sea.

Should you find yourself in a situation that requires piloting in coral at night, it's good to remember that a barrier reef will show up very well under a powerful spotlight, as discussed in the section on visibility at night (page 205).

Be sure the spotlight cable will reach to your perch aloft, and take a look once or twice at night when at anchor to get a feel. An emergency might crop up where this bit of practice comes in handy.

MALAITA ISLAND

The rumble of anchor chain on coral wakens me. Lying groggily in our forward double bunk, I try clearing away the cobwebs of sleep. Awkwardly, so as not to wake Linda beside me, I fumble for my watch. 0445. The tide has started its ebb, and *Intermezzo* has swung around.

I head topside to check the weather. The morning stars are brilliant, and the sky looks clear in all directions. "Hope it stays this way," I mumble to myself as I head below for a few last winks.

Intermezzo and her crew have been temporarily trapped inside a maze of coral-infested waterways at the north end of Malaita Island in the Solomons. We have been lured to Lau Lagoon with tales of ancient man-made coral islands, the best barter market in Melanesia, and the hope of acquiring artifacts. Now, the forepeak is jammed with our successes, and we're ready to exchange this labyrinth for the safety of the open sea. With charts and other aids to navigation marginal, safely making our way to deep water will require eyeball navigation.

Celestial Issues

Several factors must work in our favor. First is sun angle. Because it is October, the sun is just below our latitude (9 degrees south). Visibility will be best in a west to northwesterly direction early in the day and in an east to northeasterly direction in the afternoon. We will have some viewing range directly to the north except for an hour on either side of local apparent noon.

I silently wish it were later in the year. If the sun were lower, its declination further south, I would have a good range of visibility to the north for most of the day—and that is the general direction we will be heading.

Help

Cloud Cover

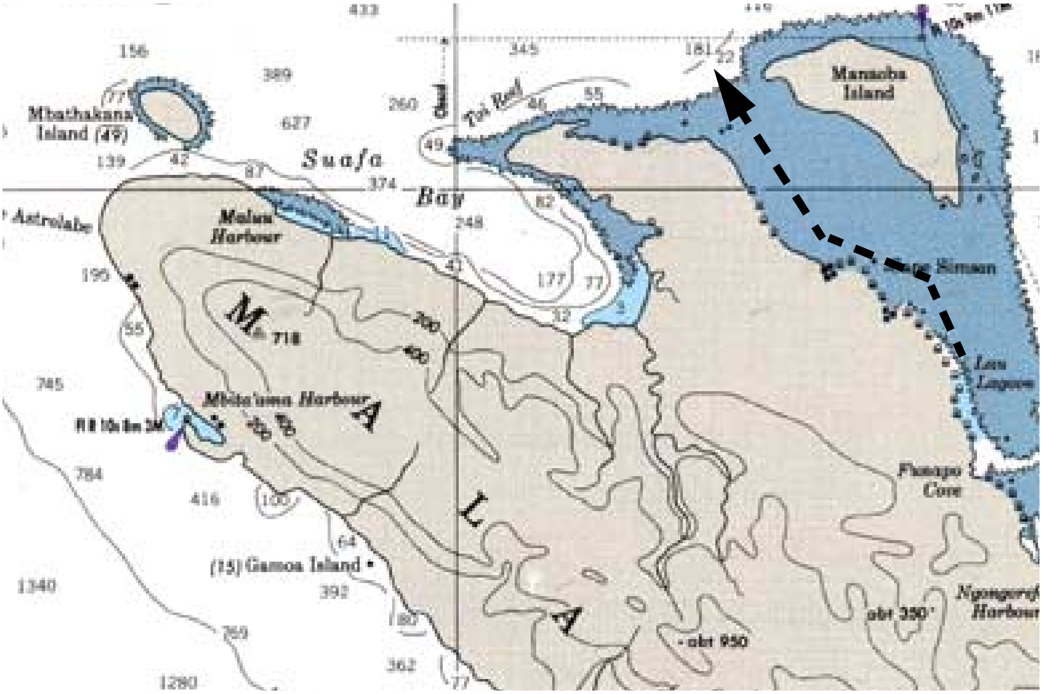
The weather will also have to work for us, and this is what provokes the most worry.

A beautiful, clear sky allowed us to enter the lagoon without difficulty. But for the last five days we have had periods of intermittent overcast and showers. To exit safely we need at least four hours of clear sky. (An overcast sky produces no shadows beneath the water surface, making it next to impossible to discern what lies below.)

A few clouds can be dealt with—we'll simply have to interpret their shadows. But the dark spots they cast on the bottom resemble coralheads, and it is sometimes difficult to tell the real heads from the shadows.

Morning arrives and I am pleased to see blue sky. The current is running swiftly, dropping the water level several feet. Good. The lower the tide, the easier it will be to make out the edges of reef and free-standing heads. Most of our trip will be made at low or slack low water.

Malaita is one of those magical places which take some work to get to but, once there, are worth the effort. Above, one of the manmade islands used by the locals to protect themselves from highland tribes. Below, Linda negotiates for "shell money".



Lau Lagoon, on the northeast corner of Malaita Island in the Solomons. The dashed line shows the general area through which we had to work—the details on the chart then were no better than what you see here. It was twist this way and that, going slowly enough to not damage the boat if we hit, but fast enough to get out before the sun went into the west at which point we'd have difficulty seeing.

Pre-Departure Once-Over

Our ship's clock sings out 0800. It's time to get ready.

In another half-hour the sun will be high enough in the east to allow us to start in a northwesterly direction. I check the engine V-belts and the water and oil levels and have a look around for electrical or hose chafe. Nothing is amiss. Elyse hands me a flashlight, and I crawl under the companionway to inspect steering quadrant and cables. Under the conditions in which we will be piloting, I want to be certain everything is going to work!

On deck sail covers are removed and halyards attached. I don't expect to sail, but if the engine develops a problem, we need to be ready to set canvas instantly.

A light tradewind ruffles the water surface. Down-sun I can see the coral 30-feet (9-meters) below us. Three hundred feet (90-meters) away the irregular edge of the reef is clearly outlined. Up-sun, to the east, there is a blank: no visibility.

Water Clarity

Lau Lagoon has a good tidal flushing action and almost no man-made pollution. The closest island mass is several miles away and mainly volcanic so the likelihood of suspended sediments clouding our viewing is minimal. There is little runoff anyway.

The sediment that rivers deposit at their mouths and for some distance out to sea can cut visibility substantially. Rain creates two problems. One is direct visibility. A light shower will cut viewing by 80-percent or more.

If there is a runoff from the land that carries mud or debris, the effects of the shower will be long-lived. However, it hasn't rained all week in any substantial way, and the nearest significant river is twenty miles to the south.

We're nearly ready now. I go forward to check our second anchor. It is unlashed and ready to go, just in case. So is our stern hook. I bring our little diesel to life, and Linda comes up on deck. "Here are your hat and glasses," she says. "I brought up the dark ones."

Underway

I slip on the hat and glasses, and Linda and I repair to our respective stations: Linda to the helm and, once the anchor's raised, I to the rigging. I climb the teak ratlines until I am 15 feet (4.6 meters) above the water, halfway to *Intermezzo's* lower spreaders. I can now see down-sun 600 feet (190 meters).

The higher I climb, the better will be my vision underwater. But for now, with clear water and the sun at a good angle, 15 feet (4.7 meters) is fine.

"Head for the first triangular marker to port," I yell aft.

This is marker #19 on the chart I have fastened to the clipboard I carry up the rigging with me. As we pick up speed the coralheads flash by 20-feet (6-meters) below our keel. The water is a light blue right up to the steep sides of the coral canal we traversed.

"Hold her at 3.5 knots." Because *Intermezzo* has a folding propeller, as we dare go no faster in case we need to stop suddenly.

As marker #19 comes abeam we swing 15-degrees to starboard to follow the channel due north. The sun's glare blanks out the coral directly on our starboard beam, but ahead and slightly to starboard I have some degree of visibility.

"Move over toward the port side of the channel," I tell Linda. "Keep about 50-feet (15.3-meters) off the coral edge."

Looking to port, down-sun, I have an excellent view of the coral. For now, hugging this side of the channel keeps us clear of any dangers that we can not readily identify on the opposite, up-sun side.

Then ahead I see the water turn a pale green. That will be about 10-feet (3-meters) deep. "Getting tight on this side" I say to myself as I signal Linda to move toward the center of the channel.

Over the next two hours, keeping a wary eye on the climbing sun and on the sky to windward for any cloud masses, we wend our way through the coral maze. Then there's just a short way to go and one shallow spot to cross and we will be in deep water again.

Tidal State

Ahead and to starboard I can see coral fully exposed by the low tide. And although I can't see below the surface because of the sun's angle, I know there's more coral close by underneath as well. The boiling, turbulent wave action in the top 6 to 12 inches (150 millimeters to 300 millimeters) outlines their position clearly.

Directly ahead, in the northwest, the water changes from light blue to light green to white. That will be the seven-foot (2.1-meter) spot shown on the chart. Since coral grows at a rapid rate it may be shallower, and Linda moves *Intermezzo* to starboard a bit in the darker water; there's no sense in scraping bottom paint off the keel.

With the sun now overhead, I can see well to port and starboard and out quite aways. But directly under our bow definition is lacking. Here I have to rely on the depthfinder. "Slow down to two knots. Start singing out the depths, please."

"14, 14, 12 feet (4.3, 4.3, 3.7 meters)," comes Linda's reply.

"Cut her back to 700 rpm, just enough for steerage."

Intermezzo's prop slows its vibration in response. We are crawling forward at barely a knot. "Ten feet, 9, 8 (3, 2.7, 2.4 meters). Are you sure we're in the right spot?" Linda questions.

"We'll be free in a few more minutes," I answer, evading the issue.

A sudden thump and crunch indicates that Linda may have had a point. I grab cap and lower shrouds to hold my place as *Intermezzo* comes to an abrupt stop. Linda has the engine in reverse before I can speak, and we slide backwards off the coralhead.

"Missed one," comes my sheepish reply. With the sun overhead, it is very difficult to see directly beneath the bow. At a slow speed with a stout fiberglass hull, we can take an occasional bump, which in this type of piloting is to be expected.

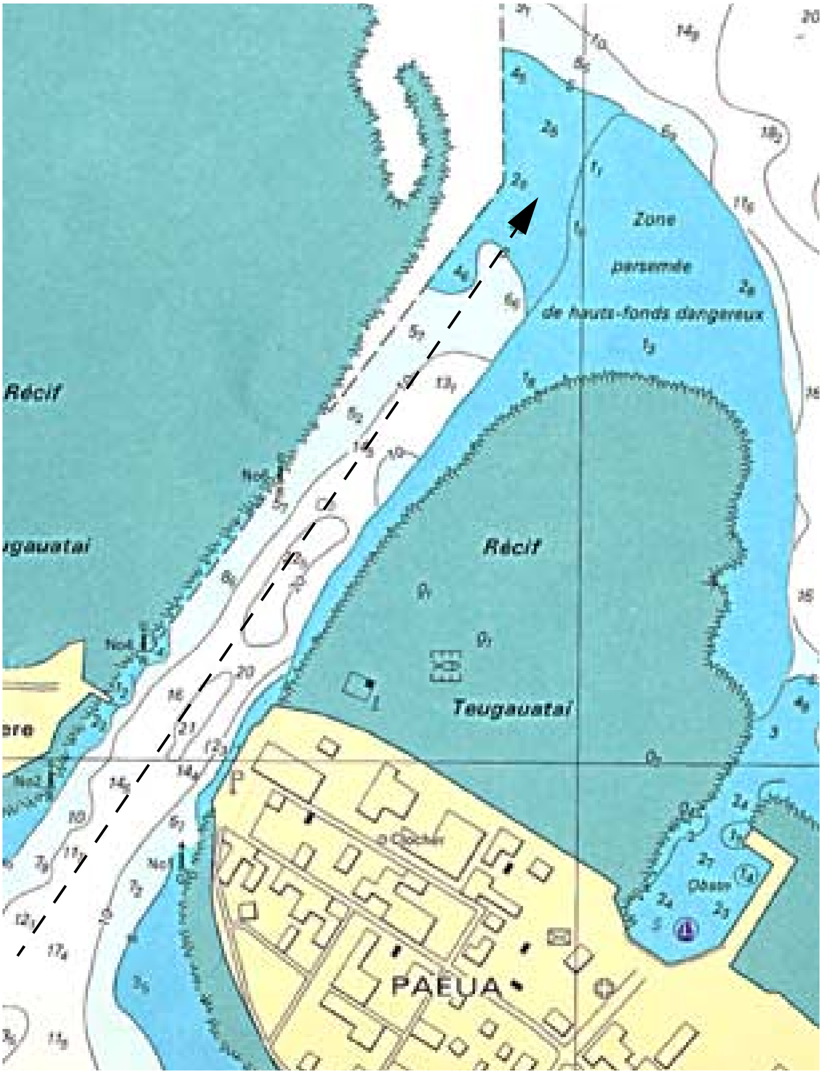
Once more we proceed slightly to starboard. I can see the head, really more of a cluster of heads, as it glides by. "Okay, we're clear now; swing back to 315-degrees, and head for that patch of dark blue water!" We are back in open ocean.

When in Doubt, Don't!

Piloting in coral and running tropical passes in the right conditions is a wonderful, exhilarating experience. The colors of the water, coral formations, and promise of a new anchorage are all alluring. But you must have the right conditions. And you need a healthy respect for the consequences of errors.

If there is one bit of advice we'd like you to keep in mind it is: never let yourself be pushed into a decision. The siren song of a party ashore, a protected anchorage, or the potential of a quiet night asleep can lead to the loss of your yacht, if conditions are not right. When in doubt, don't!

Should the foregoing sound daunting to you, remember that it wasn't too many years ago that these passes and lagoons were navigated on a regular basis by unwieldy, heavily laden, sail-powered copra schooners.



Did your parents tell you "do as we say, not as we do"? Well, the pass into Manihi Atoll in the Tuamoutus is one of those situations. The lagoon at Manihi is reputed to be wonderful, but the pass is difficult to thread. Knowing this, and with an up-to-date chart, we decided to give it a try with Beowulf.

The depths above are in meters and, as you can see towards the top of the chart, at the inner edge of the pass, it gets a little thin. However, even with Beowulf's 7'9" (2.4 meter) draft we figured we could find our way in. The fact that the boat is stoutly built of metal, has a tiny keel with no protrusions at the bottom to trap it (wings and bulbs are a disaster waiting to happen in coral) and we had a very powerful engine—were all major factors in our decision.

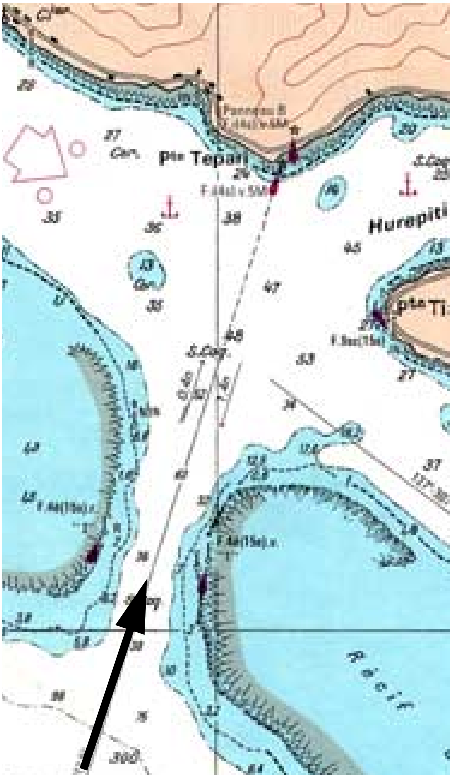
We arrived off Manihi before first light, and hove to awaiting good visibility. This was in August and the sun was still north of the equator. By 0700 we were threading our way into the pass, and the first part, opposite the town, was accomplished without difficulty. The current was running at 5 knots, and we crept forward at 7, giving us speed over the bottom of 2 knots—with good control from the 7 knots through the water. The sun wasn't really high enough to make out the details except to the west, down-sun. Ahead was marginal and anything to the east was a blank.

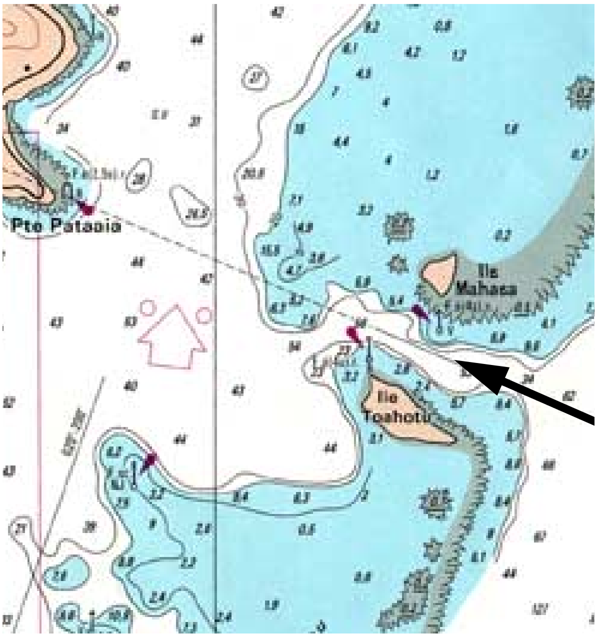
As we crept forward the water became shallower and the current accelerated until we were doing 11 knots on the speedo, making about 2 knots over the bottom. There were small whirlpools trying to shear the bow this way and that and we became concerned that we might be getting ourselves into difficulty. The problem now was how to turn. We could not turn to port as it was too shallow, and we couldn't turn to starboard because we couldn't see in that direction. About the time we were both thinking this was really stupid we grazed a coralhead. No big deal except it slowed us momentarily, the bow sheered off a few degrees, and the current suddenly whipped us around 90-degrees and began to push us sideways into the coral—and then it pinned the keel neatly against some medium-size coralheads.

We were able to extricate ourselves only because of the very small keel and powerful engine. On any of our other boats we would have been trapped, perhaps for a long time. The moral? Never take chances with visibility in coral!

Tahaa, the sister island to Raiatea (they share the same lagoon) in French Polynesia. There are two relatively easy passes into the lagoon (shown with arrows—details of both are shown below).Toahotu faces southeast, into the prevailing trades. Paipai faces southwest, theoretically in the lee. Both nowadays have ranges and a set of reef edge markers, but both still require good visibility unless you are familiar with them from previous visits. The southeast facing pass will have good light until about an hour before local noon. The southwest facing pass, where you're heading almost north to enter, requires a very early or very late sun. The process is reversed when leaving.

Sea state is another issue entirely. The southeast tradewind swells obviously are going to make the entrance to Toahotu challenging if there is a lot of opposing current. Paipai is usually easier, unless there's a northeast (or westerly quadrant swell. With both you will often find the edges of the pass breaking and a narrow passage between breakers close to the center.





Help

When You Can't See the Bottom

Even the big guys make mistakes. This ship wandered out of the channel and hit a small rock, which punched a small hole. Somehow in the ensuing salvage attempt a fire started and now here she sits.

Because of the mangroves, water clarity was lacking.

The previous sections notwithstanding, if you're caught in mid-passage and visibility deteriorates, or if you cruise where the luxury of clear water is a rarity, there are techniques for discerning the secrets which lie beneath the surface when you cannot see the bottom.

Surface Signs

You can learn much from surface disturbance. Changes in wave patterns, current boils, even changes in the color of the water can give critical clues. And as we've mentioned several times already, it's critically important to know the state of the tide while you are traveling, as this will have a big effect on what you can see at the surface.

In calm conditions a reef which would show a small break with 3 feet (0.9 meters) of water cover, might remain hidden in 6 feet (1.8 meters). When we have a long passage to make where it will be important to read the water, we draw a curve of the tidal height versus time in the log. This gives us a handy visual reference on the state of the tide at any given time.

Rocks, coralheads, and reefs disturb the surface if the current or a sea is running. The closer they are to the surface, the more they will show up—which of course is a function of the tide.

Currents

Another clue comes from current action, which is usually related to the tidal state.

Current tends to flow faster where the water is deepest. You will often find back eddies and/or whirlpools along with abrupt transitions or shelving in water depth.

Rocks and small areas of shoals also create disturbances with current.There will frequently be a line of turbulence at a shallow ledge or where the bottom takes a turn.

Standing waves will be set up as the water moves around obstructions. If the obstruction is several feet below the surface, the sign of its presence may be no more than a light swirl—but it will be there.

Help

Is this just a rock (under black arrow) or is it a wider reef? The small wavelets on either side indicate that the shallow water extends quite a ways from the rock. This is at quarter tide. At high tide this rock will be covered with 6 feet (1.8 meters) of water. With a current running, it will show boils at the surface. But at high slack water, nothing will show.

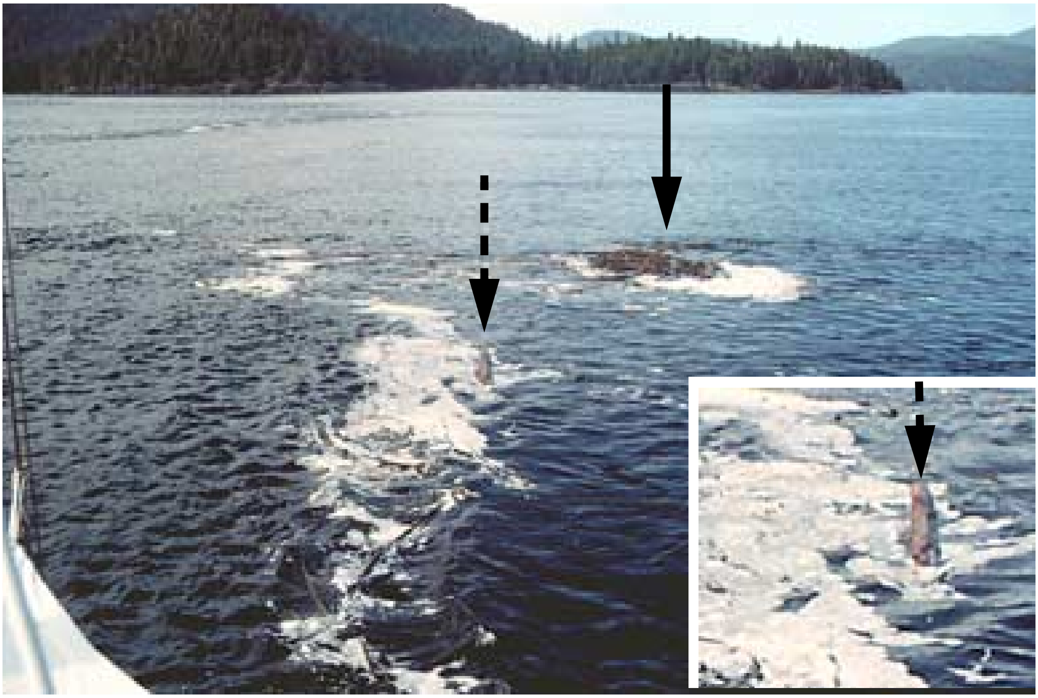
The same area, now at 3/4 tide, with the current running 3- to 5-knots. Although the rock and reef are submerged, there is a clear indication of their presence on the water's surface.

The development of surface disturbance gives some indication of the shape of the obstruction below. A quick change at the surface means a sharp underwater change as well. With a steep rock or bank the surface won't break until the waves are very close in.

Water Color

Subtle color change can be another indication of sub-surface disturbance.

In dirty water you will occasionally see a definite color line between shallow and deep water, or at current shear points. This will usually take the form of darker or lighter shades of brown.



Debris fields often indicate shallow water, but also show up at the interface (shear line) between two currents, as is the case in both of the upper photos on this page. Above, the solid arrow points to the accumulation of debris, while the dashed arrow points to a "deadhead" (which is enlarged in the inset). A deadhead is a long chunk of timber often floating just below the surface. The photos on these two pages were taken in British Columbia and Alaska, where you should never try to run at night!

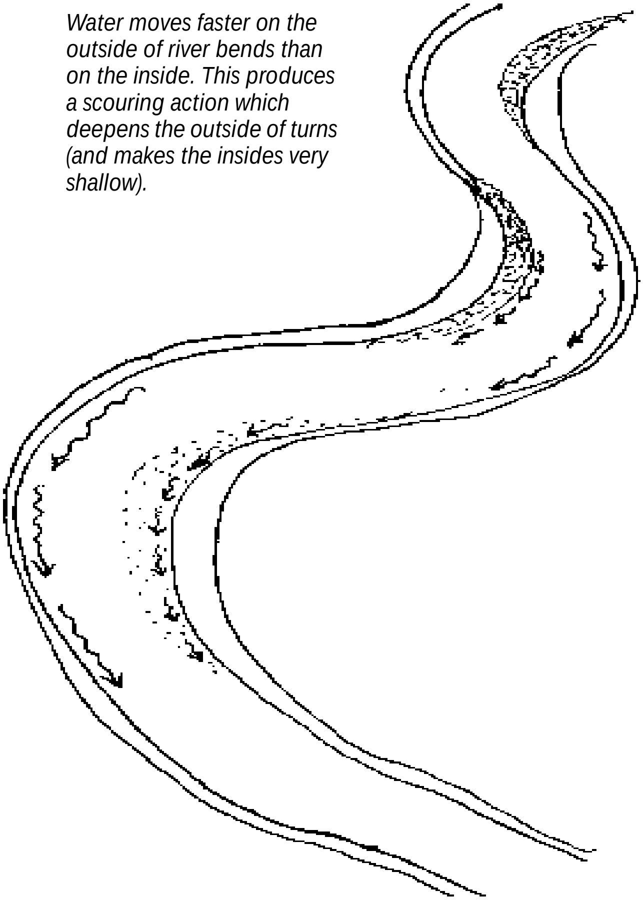
In the lower right photo we see a small whirlpool. While these often indicate rocks just below the surface, in this case it is caused by a shear line of current. How do you tell the difference? If you know the state of the tide and related current you then can tell if it is possible for current to be the cause. When not sure, slow way down and softly nudge the bow into the disturbed water. If it is shallow, you can back off and find an alternate course.

Debris Fields

If is not unusual to find conglomerations of debris—weed, flotsam, or perhaps trash—at the convergence point of two bodies of current.

These may indicate a simple meeting of two different types of water flow (perhaps salinity or temperature are different) or they may signify an underlying disturbance.

Lines of bubbles can also mark current shear points, which warns of a change in water depth.



Water moves faster on the outside of river bends than on the inside. This produces a scouring action which deepens the outside of turns (and makes the insides very shallow).

Going around Curves

In channels, the current flows faster around the outer bends of curves. This usually results in deeper water on the outside of most bends, as long as the channel is mud. With hard rock there will rarely be enough scouring action.

On the other hand, if you are navigating against the current, the inside of bends and/or shallower water will provide the least current to fight.

Watch the Critters

Animals, especially birds, often give sign of shallow water. Some birds walk in the shallows, picking up tasty morsels as they go. Obviously, if the water is shallow enough for them to walk, it's going to be a problem for most boats.

Look at the slope of this tidal sandbar. Notice how it slopes gradually to the right, towards the water. The odds are that the gradual slope will continue quite a ways underwater, so give this type of spot a wide berth.

Help

Buoyage and Markers

As we've said before it is always best to avoid the use of nav markers unless you know for certain they are properly placed. Generally, in "First World" countries, they are okay to use. But as you cruise farther afield, nav markers tend to be less reliable.

Keep in mind that the buoyage systems are different between the inland waters of the US and offshore. They change from country to country as well. (See page **257** for more data on this subject.)

The buoy in the photo above gives a good idea of which way, and how strongly, the current is flowing. In this case, the water flow is from right to left across the photo.

Using Ranges

You will often find ranges for guiding you in through a narrow channel. These work much the same as the ranges on ships (see page **223**) except that the markers and/or lights are fixed onshore.

One problem to watch for at night is interference from surrounding lights. Range bearings are almost always called out on charts. So, when the range is lined up, be sure it is at the correct compass heading. Also be sure that the true bearing given on the chart has been converted to a compass bearing.

In these photos we are heading towards the left aboard Beowulf in Gatun Lake, between the locks in Panama. The left photo shows we need to head to port to get the range aligned. Center photo: We are right on the range. Right photo: We would need to head to starboard to get back onto the range.

A local "boat boy" on the island of Dominica in the West Indies.

"Local knowledge" needs to be taken with a healthy dose of scepticism. When a local tells you "there's plenty of water, Captain" wait until you can confirm that with a depthsounder or your eyes, before committing yourself.

If you pick up data from another cruiser, ask yourself how good his or her judgement is likely to be. Often, information shared amongst cruisers is wonderful. But we find it safer to rarely accept what we hear at face value, if the safety of our vessel is at stake.

If You Are Unsure

In this section so far we have provided a lot of data on navigating in both clear and murky water. As you know by now, with a little luck and some foresight, you will be able to tell the difference between deep and shallow water.

But the time will come when the conditions are such that you are not sure of the best course to take. Perhaps you started out on a cloudless day, and a new weather system moved in, and now you cannot see a thing along your course.

When there is risk to the vessel or her crew from uncertainty it makes sense to have a backup plan worked out in advance. This way, if the existing situation becomes unmanageable, you can switch to "plan B" without delay.

This may involve backtracking to an anchorage, or stopping right where you are. Or, you may have to alter course to a new heading so that visibility improves.

Sometimes haste will be an acceptable risk given daylight or weather considerations, but usually it is best to take it slow and easy.

Feeling Your Way

But if external factors are not forcing you to move, it is better to proceed with caution. Slow the boat down and *feel* your way.

On more than one occasion we have put ourselves aground using the keel to feel for deep water! As long as you are on a neutral or rising tide, and you hit while moving slowly, no damage will be done.

It is worth repeating that any time there is a risk of running aground, a kedge anchor should be ready to go in an instant. And the dinghy which sets the kedge should be connected to its sling, ready to launch.

Help

Crossing a Breaking Bar

Running through breaking waves across the entrance to a snug inlet or river mouth is surely one of the most hazardous tests of seamanship, something to be avoided where possible. Yet commercial fisherman, and some sailors who live in areas with lots of breaking entrances, do make safe passages when conditions are less than ideal.

A collision of short- and long-term forces of nature creates the problem. The need to seek shelter exacerbates it. Time, patience, and a well-thought-out plan are the ingredients from which success is forged, *and this includes having an alternative to running the entrance.*

Current State

An ebbing current opposing either locally or offshore-generated wave systems can create unstable, often dangerous seas. The more the current or the larger the waves, the greater the chance the sea will crest and break. When this situation occurs over a rapidly shoaling bottom or the sand-bars that often exist at river mouths and inlets through barrier islands, breaking waves are a certainty.

These rapidly moving cresting seas make it difficult to maneuver most small yachts, and if you are caught in the wrong part of the wave at the wrong time substantial damage to yacht and crew can result.

Tidal Influences

Where and when a breaking sea develops over an entrance bar is influenced by the height of the tide. When the current reverses and begins to flood back in, water depth increases, and the tendency of the shallow water to cause the waves to break will be reduced. And, current flow in the *same* direction as the waves smooths out the seas. Many bars that develop dangerous breaking waves at low water or half-way through the ebb cycle are stable at slack water or when the current has started to flood back. In some entrances tidal height is even more critical a factor than the direction of the flow.

You must consider the monthly tidal cycle as well. At springs, when the moon and sun are working together to exert the most force on the oceans' tides, the effects on the bar will be the greatest at times of adverse current or depth. At neaps they will be minimized.

Wave Height and Period

The state of the sea is another factor to consider in assessing the safety of crossing a bar. Locally generated wind waves with short life spans are apt to be predictable. But waves created by a distant storm change size very quickly as they hit the bar. They may arrive unannounced and be inconsistent, washing through in large sets now and then.

This is one of the causes of what are referred to as “sneaker” waves. These are seas which appear to be of a different pattern. Sometimes they are much larger than the other seas, or break with a bigger curl.

With most entrances flanked by shoals and/or breakwaters, there is usually some form of reflected wave generation (backwash). As this energy meets the incoming waves it can cause an otherwise stable wave to break.

Bottom Condition

One of the most illusive bits of data is bottom condition. Many bars have constantly changing contours. Local buoys cannot be relied upon unless verification of their accuracy is made with harbor or Coast Guard authorities.

In spite of these uncertainties bars can be used, even in potentially hazardous conditions by people *familiar* with crossing procedures in general and the bar in question in particular, on the correct type of vessel.

How Will Your Hullshape Do?

You must first evaluate how your vessel will react in the crossing situations. The condition is analogous to surfing in big seas. Just as you need good steering control to keep your vessel from broaching when running free in big waves, so you need ultimate steering control when riding a breaking wave across a bar.

Light-displacement, long-waterline vessels with large detached rudders will handle best. At the other end of the spectrum are heavy-displacement, long-ended, full-keel sail or heavy-displacement motor yachts. Vessels of this type can be coaxed safely across, but they will need milder conditions and will go with less of a safety margin.

Preparation

Reliability of power and steering is obviously critical. It is a good idea to check the drive line, steering system, and engine accessories before crossing a bar.

All deck gear must be well secured. Wash boards should be in place in the companionway, and all hatches properly dogged. Any Dorade vents should have their cowls removed and be plugged on the inside as well as outside.

If you have large doghouse windows it is a good idea to get out the storm shutters.

Whether you are sailing or powering, running rigging needs to be carefully made up and secured. The last thing you want is a line in the prop or jammed in the rudder.

Before making the final approach be sure all crewmembers don their lifejackets. If you are in cold waters survival suits should be worn.

There is debate about safety harnesses. Some feel you are better away from the boat if she rolls over. Others feel staying with the vessel is important.

There is more immediate danger to you from contact with the vessel, but if your vessel is closed up and watertight and has a low center of gravity, you'll be floating right-side up in a matter of seconds.

Being thrown clear avoids contact with the boat, but leaves you at the mercy of the surf conditions that will make it difficult to find a man overboard. Professional fishermen and the Coast Guard tend to wear survival suits just in case.

Finally, all crewmembers should be well braced, where they can hang on tightly with efficient use of hand and arm strength.

Judging Wave Patterns

The technique for crossing bars will vary with type of craft and conditions. On the outside, looking in, you must remember that *seas always look smaller from their backs*.

Height from which to judge the waves is a help. Try for a perch on the lower spreaders. Then, give yourself plenty of time to study the pattern of the seas, and where they are breaking, keeping an eye out for any unusual arrivals from a distant blow.

If you are not certain of the bottom contour and depth, the pattern to the sea's break will give some indication of where the channel runs deepest. If the current is modest, the seas will steepen more quickly where the water shoals. If there is a strong ebbing flow, the breaking seas will be greatest in the deeper parts of the channel where the current is strongest. But to be able to use this form of analysis, some local knowledge is necessary.

Waves come in "sets", generally two or three minutes of large sets followed by periods of *relative* calm. If the distance from where the break begins to protected water is short enough, you may get across during a lull.

Stay well outside the area where the sea is humping up and time the sets. Watch at least a dozen sets of breakers and lulls to make sure of the period.

Once again, look out for waves which are reflected back from shore or the breakwater which may cause an incoming wave to break prematurely. These reflected waves may not be in sequence with the larger sets.

Be aware that every so often a really big set may roll in, sometimes twice as large as the normal sets and this may break much further from the entrance than the previous waves.

Wait until the tide has turned in your favor and is flooding back to have the safest shot at crossing a bar with breaking waves. In most cases the ideal time will be just before the beginning of slack high water.

Running bars with an ebbing tide reduces the odds of success.

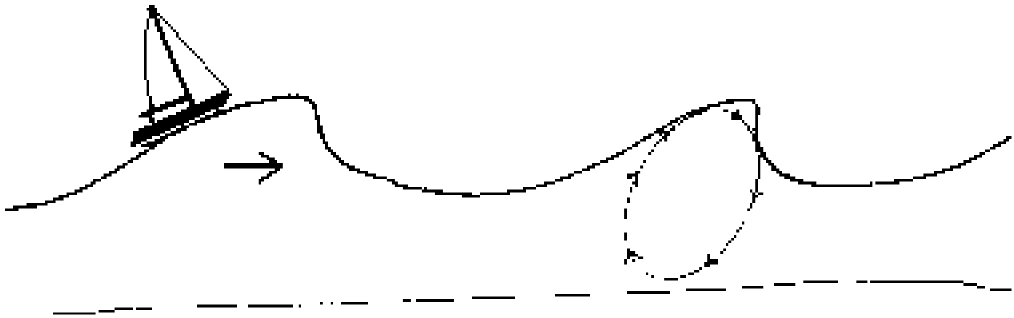
In many parts of the world ports with bars have Coast Guard or lifesaving teams on duty who can be called on VHF for information. In passable but potentially dangerous conditions they will often assist you via radio or a patrol boat to pick the right moment.

While these professionals will probably have significantly greater experience than you do they are not always infallible. The final decision is always up to the skipper. When in doubt—don't try it.

Watch the Locals

If other vessels are running the bar, don't follow the first one you see. Watch a series of boats, noting when, how, and where they go. Be sure to factor in draft. A moderate-displacement fishing vessel will frequently draw only half the water of a comparably sized sailboat.

Be wary of advice given by amateurs.



The best place to start running a bar is on the back of a crest. Where you don't want to be is on the face of the wave, where the building crest can overtake the boat, causing it to broach and roll.

Technique in the Break

Once you are committed to the entrance, it is critical to keep your stern square to the waves. Try to ride on the back of a sea. The minute a crest starts to lift the stern you quickly lose steering control, and if your stern should be pushed aside a broach is the usual result.

Very few sailboats or displacement powerboats will have the power necessary to stay with a wave for much distance. If you will have to ride more than one wave, the boat must have good surfing qualities. Otherwise, stay offshore until the bar is quiet or seek an alternate harbor.

In the crossing process you will want to be scanning ahead and behind.

What happens if you are committed to the crossing and then notice a large set coming in behind you? The Coast Guard teaches their surf boat skippers to turn their bow back towards the breaking crest, heading for the smaller side of the break.

They use full power and full rudder. Just before impact with the wave they are taught to remove their hand from the throttles. This insures that they won't inadvertently pull power off as they are hit by the crest.

You can try this technique yourself outside the bar: position yourself midway between two crests, and then try the fastest full throttle turn noting how far around you get before the next crest is at your bow.

Inside Looking Out

From the inside of a harbor or river mouth looking out, a better evaluation of the conditions both as to wave size and timing is possible.

You want to pick a smooth patch of water and then go as fast as possible to get beyond the breaker line. If you make a mistake, and it appears that a sea will break aboard, it is critical to get the bow straight through the crest. If the crest can be penetrated before it breaks you may be rocked at a severe angle, but damage is unlikely. If you are caught remember that another sea is following. You must push on before the next one catches you. Getting out beyond the breaker line is critical.

Worst Case Scenario

The worst scenario is to lose power or steering after committing to the crossing. In this case, a ready-to-use anchor, quickly deployed, may hold your bow into the oncoming seas, improving chances of survival.

The right and wrong way! This series of photos were taken at the entrance to the harbor at Ventura, California. A winter storm with southerly quadrant winds had been building for a while.

The top photo is an oil rig crew boat heading out. They've picked a smooth spot and have plenty of speed to get them beyond the break.

The rest of the photos are of a small fishing boat, converted from an old Coast Guard surf boat. Slow, and in inexperienced hands, they pick a large set to head into. They make the first wave, then barely make it past the second—and look at that set coming in the background!

Betsy Clapp and Bob Wake photos

Help

This story has a happy ending (but many like this do not). The engines continued running, the crew got the boat back under control, and they headed back into shore before being caught by that big set in the background of the previous photograph.

Note the crew on the right. His attention is fixed on the oncoming series of bigger waves.

More on Current

There are several other issues with current which need to be considered. First, if you are heading towards the entrance with a flood (ingoing) current, it is improving your speed over the bottom relative to overtaking waves.

Since the time it takes you to cross an area subject to breaking is a function of boat speed, and current, the flood will help in this regard.

However, if something goes wrong—perhaps you have a mechanical problem—that same current will carry you inexorably into the surf line.

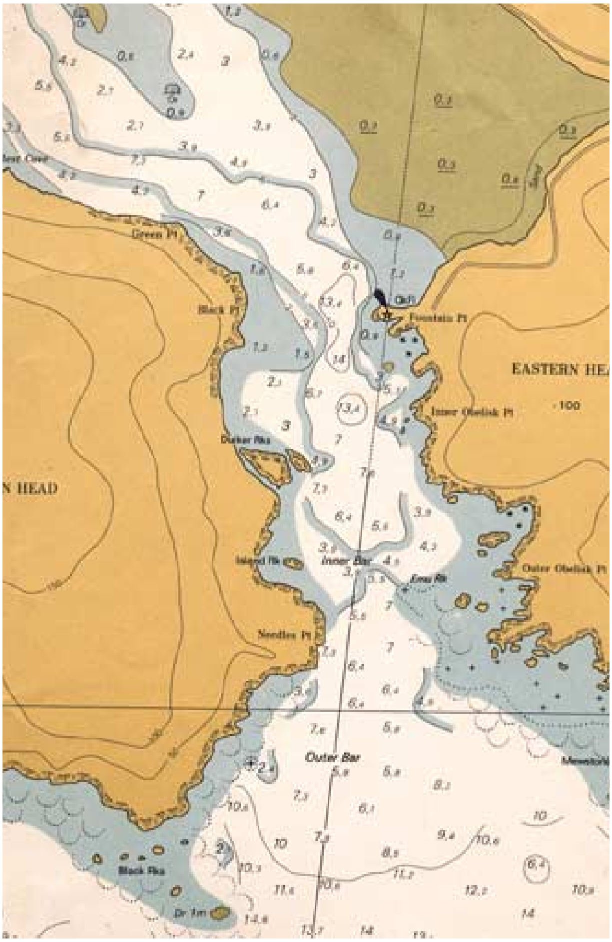
On the inside, waiting to get out, the current is working against you, slowing you down.

Although our own feeling is that one should never cross on an ebbing (outgoing) current some people do. This has the effect of slowing down your passage into the safety of the harbor entrance when you are inbound. On the other end, if you are outbound it will speed the passage, but will also carry you into the surf if there is a mechanical difficulty.

Knysna Lagoon

While we had done lots of offshore surfing in big boats, and certainly run our share of beach cats ashore through the surf, it wasn't until we'd sailed half way down the South African coast aboard *Intermezzo* that we ran our first breaking bar.

Knysna Lagoon had a reputation as a treacherous opening with a sea running, but otherwise relatively easy to pass.



The entrance to Knysna Lagoon, on the east coast of South Africa. Not shown here is the huge expanse of lagoon on the inside, which fills and drains each tidal cycle through this tiny opening.

Looking at this chart today, and thinking about the characteristics of Intermezzo, we probably would not repeat the process! But with the right conditions, and a more modern, faster boat, we'd not hesitate.

A narrow entrance, less than 100 feet (30 meters) wide, it is fronted on either side by sheer cliffs. Behind this narrow opening lay several square miles of relatively unspoiled estuary.

As the home to the last coastal herd of elephants, it had a particular allure for the four of us.

The problem with this peaceful lagoon lay in its size. As the tide dropped a current of as much as 4 knots would ebb out the entrance. And when that ebb met the oncoming swells from the Southern Ocean a huge break would occur.

We arrived at the heads two hours before high slack water. With the tide flooding in, the current was with the swells, reducing their size. Still, as the 12-foot (3.8-meter) swells began to feel the bottom near shore they would start to hump up. But only the occasional swell, bigger than the rest, would break.

Linda was at the helm while I spent my time aloft, watching the sets and how they interacted with the shoreline.

The wind was almost dead calm, but the roar of the surf hitting the beach plus the concept of an unfamiliar and potentially risky passage had us both on edge.

As these events were unfolding, in December of 1979, *Intermezzo* was considered a good surfing boat. Her large spade rudder made for good control when we were sliding down a wave face, and the hull shape, although ponderous by today's standards, had enough of a run aft to allow us to move quickly once we started to surf.

The clock wound down, the tide continued to rise, and we all watched the wave sets.

By the time high slack water was at hand the tide had risen about three feet (0.9-meters) from what it had been upon our arrival and the seas had calmed considerably.

We commenced our run in, moving at half throttle at first. As we neared the point where the waves were starting to really hump up we went to full rpms leaving a trail of black exhaust smoke in our wake.

As the heads neared and I realized just how narrow they were, my heart was in my mouth.

Help

But the sea stayed calm, and we passed by without incident, into an idyllic setting.

Of course once we were inside we were then faced with finding the right conditions in which to depart. We also began to hear stories and see photos of commercial vessels and cruising yachts that had been less fortunate in the bar conditions.

After a week of sightseeing and meeting the locals we began to watch the bar conditions as well as the local weather reports. Another week passed, and then one afternoon we had high slack water which coincided with a moderate sea state.

Up came the anchor, all loose gear was carefully lashed, and out we headed.

Once again we waited for two hours counting wave sets and watching for sneaker waves. When a particularly small set seemed ready to come through off we went.

The exit went without a hitch, but I wouldn't want you to think that we weren't apprehensive.

Pacific Northwest

Many years later Linda and I were taking *Sundeer* towards a summer in Alaska. We were working our way up the Pacific coast, following on the heels of cold fronts, taking advantage of the southerly quadrant winds to ease our passage north.

We'd been fortunate along the way with entrance conditions. Both Morro Bay in central California and Eureka in northern California had been calm when entering and leaving.

Now we were hove to at first light off the entrance of the Siuslaw River, with a moderately breaking bar.

With friends just a few miles up the river in Florence, Oregon, we were anxious to cross the bar if conditions were reasonable.

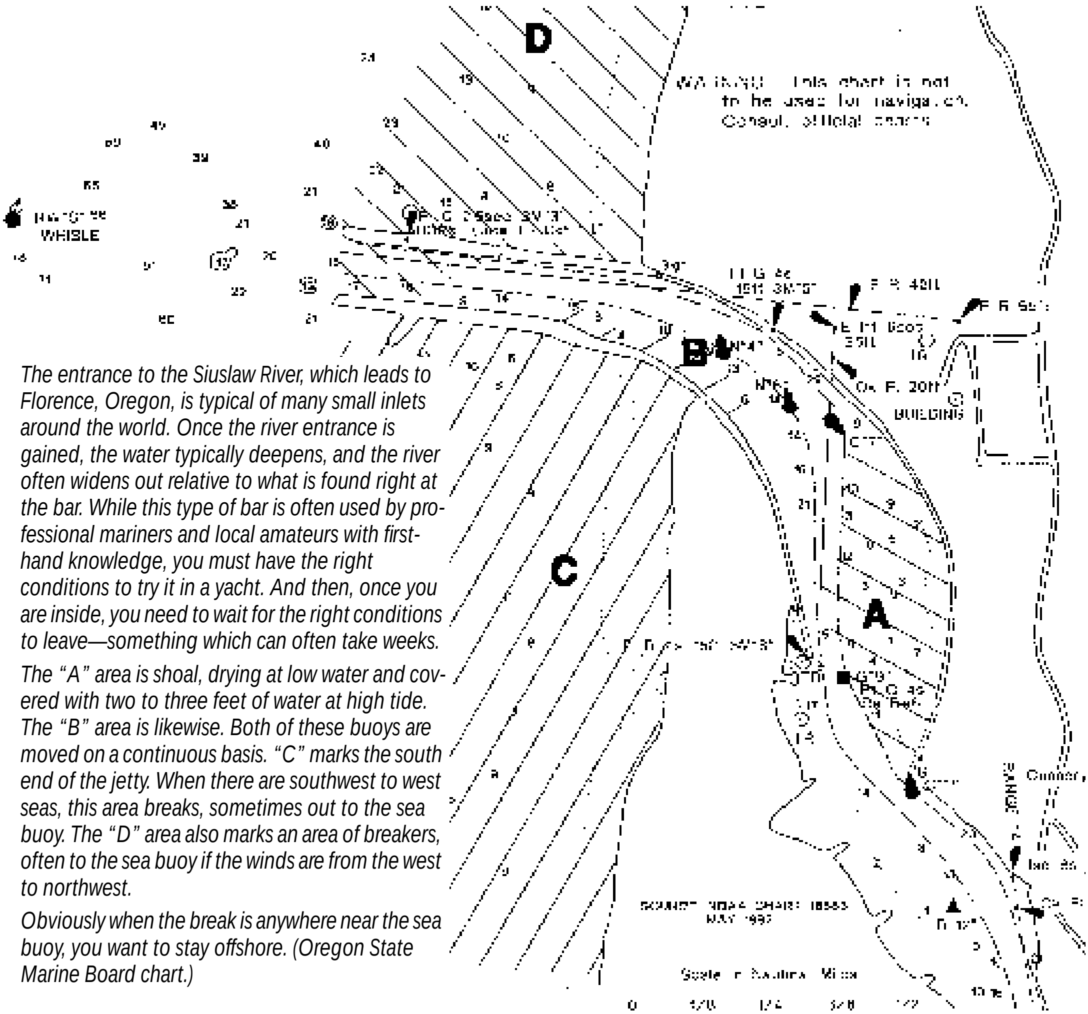
As you can imagine *Sundeer* was a much better surf boat than *Intermezzo*. She had a long, efficient hull shape, a nicely rounded bow which had no tendency to dig in, and a huge spade rudder which gave us fingertip control and a very tight turning radius.

In addition, she could maintain a 10-knot average under power. All of these factors added up to a huge increase in the surfing conditions she would tolerate, compared to *Intermezzo*. Still, we were not anxious to test her abilities, if it could be avoided.

Linda had checked the tide tables on our way up the coast. Calculating the offset from Eureka gave us a local high tide at 1130. With a six- to eight-foot (1.85- to 2.4-meters) swell running in from the northwest, slack water was liable to be as much as half an hour before the high tide.

With four hours to go in the cycle, we're at the one-third level of the tide. The smaller waves were making it across the bar without breaking, but every now and then a larger set would roll in and the largest waves would start to break about 600-feet (185-meters) from the entrance.

Obvious shoaling was apparent on the south side of the breakwater (to our starboard side).



The entrance to the Siuslaw River, which leads to Florence, Oregon, is typical of many small inlets around the world. Once the river entrance is gained, the water typically deepens, and the river often widens out relative to what is found right at the bar. While this type of bar is often used by professional mariners and local amateurs with first-hand knowledge, you must have the right conditions to try it in a yacht. And then, once you are inside, you need to wait for the right conditions to leave—something which can often take weeks.

The "A" area is shoal, drying at low water and covered with two to three feet of water at high tide. The "B" area is likewise. Both of these buoys are moved on a continuous basis. "C" marks the south end of the jetty. When there are southwest to west seas, this area breaks, sometimes out to the sea buoy. The "D" area also marks an area of breakers, often to the sea buoy if the winds are from the west to northwest.

Obviously when the break is anywhere near the sea buoy, you want to stay offshore. (Oregon State Marine Board chart.)

Standing on top of the pilot house, a quarter of a mile offshore, I have an excellent view of the entrance and the wave patterns.

A half hour passes and in this time there are only four large sets of waves. "Perhaps, when the tide has risen a bit the bigger sets won't break," I think to myself.

Linda goes below to pick up the portable VHF. She comes back on deck to stand at the helm, and then hails the local Coast Guard station on channel 22.

"US Coast Guard, this is the sailing vessel *Sundeer* off the Siuslaw River entrance. Do you copy?"

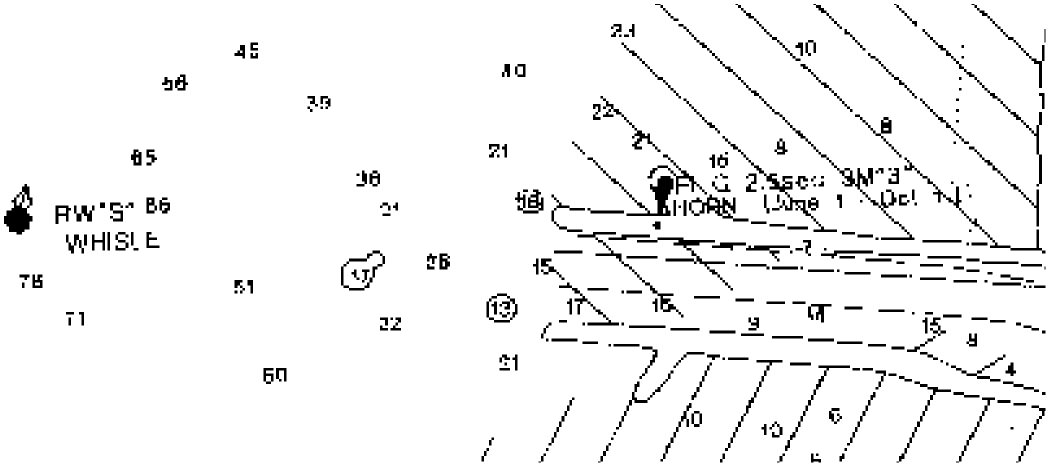
A few second later the Coasties come back. "*Sundeer*, what can we do for you?"

"What does the bar look like from the inside, and do you expect it to moderate by high water?" Linda asks.

"Please stand by while I get the coxswain," is the answer.

Linda looks at me and we both think the same thing. Sounds like we're getting the professionals involved.

Help



A detail of the area between the sea buoy and the break-water entrance.

We were standing off the sea buoy aboard Sundeer, watching the wave sets while talking with the Coast Guard.

The Coasties parked themselves on the edge of a shoal, just inside the breakwater, to mark the corner for us (by the "9" foot mark on the chart).

"*Sundeer*, this is coxswain Conroy," comes a much-older sounding voice. "We expect the bar to be passable from two hours before high water. We'll send out a boat to assist if you'd like."

That sounds good to us, and an hour later, out comes a small surfboat.

They pull alongside and I begin to question them. "Where is the deepest part of the channel?"

Pointing to the southern part of the channel, just inside of the break, the young skipper of the surf boat indicates a red channel marker. The deepest part of the channel is about 30 feet (9 meters) to the left of that entrance buoy.

"Do you have much trouble with sneaker waves?" is my next question.

"It is more of a problem with southerly sets than in these conditions," is his reply.

"What is the channel like past the entrance buoy?"

There is a brief conference and then the skipper replies "If you hug the south side until the first bend, then follow the markers, you will have at least 10 feet (3 meters) of water at high tide."

Next, it is their turn to question me. "Would you like us to put someone in the tower on shore to call wave sets to you?"

This sounds like a great idea, and 15 minutes later a very young-sounding voice comes back over the VHF. I ask the skipper how much experience his shore brethren have and I am informed that he has just joined the station.

Linda gives me a knowing look and we both silently decide that we'll use our own judgment on this venture.

A half hour passes and we continue to watch the wave sets. They definitely feel like they are softening. The increased water depth is making it less likely we'll have any problems.

It's now 1030, and the current appears to be slackening substantially. Now we have a trade off between a favorable current and water depth.

The flooding current makes the waves smaller, and as we get closer to slack and the current drops off, there will be more tendency for the marginal waves to break.

Help

On the other hand, the deeper the water is over the bar, the less chance there will be of a break.

Linda yells over to the waiting surfboat that we are ready to go. I ask them to move ahead of us, and mark the edge of the deepwater channel.

In parting the skipper shouts "we are happy to help out, but you understand that the choice of whether or not to cross, and which wave to do it on, is your responsibility."

1045: I am standing on *Sundeer's* pilot house looking aft. Linda has the engine in neutral. Occasionally she gives a short thrust of power to keep us aligned with the entrance. We drift forward at two knots towards where the waves are breaking.

Here comes a small set, I think. I begin to count the waves, one through nine, and then another set rolls in. This one is also small, but offshore a half a mile or so I see something a little higher than the waves in front.

"Let's back her up a bit," I say to Linda. I am sure that the big set which is coming won't break out this far, but no sense in not being careful.

Sundeer slips aft a few hundred yards and the sixth set of swells, twice as big as the rest, slides harmlessly under our hull and begins to break at the entrance. The next set is quite a bit smaller.

Now is the time to go, if we are going to do it. After this one large set we'll probably have a several small sets. "Give her full reverse."

Linda's hand hesitates on the throttle, and then she shoves it forward. Our Isuzu diesel begins to throb and *Sundeer* quickly accelerates to 10 knots.

I jump down from the pilot house and take up station alongside Linda, to starboard.

The swells are moving at 14- to 16-knots. Halfway to the bar the third wave in the set begins to hump up. There's no indication of a break, and *Sundeer* surges ahead on the face.

There is no question that at least two more waves in this set are going to catch up with us before we cross the bar.

The next wave comes, larger than the previous. Now we are on the face. As the crest begins to steepen we accelerate down the face, doing a good 16 knots over the bottom.

The surf boat is coming up on our starboard bow fast, and we are now surfing ahead of a small breaking crest.

While we've surfed far larger waves in the open ocean, this is the first time for both of us with a rapidly approaching harbor mouth.

With hearts pounding we slip past the surf boat and into the calm water of the Siuslaw River.

Linda and I both look back at the same time. A small smother of foam indicates where the sea has broken, and there's a small reflected wave moving off the southern shoal.

In hindsight the whole procedure was much simpler than it looked from the outside. Everything went smoothly, but if it hadn't...

Heading out across a bar, position relative to the oncoming crest is critical. In this series of four photos you can get a feel for where the boat should be in the wave. If you are late in meeting it, then the wave will have a more vertical face which is going to pitch you up, or roll down the deck, possibly taking structure with it.

In the top and bottom images on this page, the Coast Guard surf boat has gone through a small crest just as it starts to break. The emphasis here should be on small. Yet this wave could do a lot of damage if it caught you after it was fully formed. Note in the upper photo how there is a clear spot on the right corner where the wave has not yet started to break. For an amateur, this might be a better spot from which to take on this particular crest.

US Coast Guard

Help

In the photo above the situation is a little more complex. Notice on the left side there is actually a higher section of wave. The coxswain of this surf boat has moved away from that area, to bring the bow through the smoother part of the wave. The higher piece of wave may have been caused by any number of factors: bottom shape and reflected wave energy are chief among them.

Below, we have a boat having come through the crest and being accelerated forward to get in position for the next set of waves.

Here we have a boat barely making it through the crest. Maybe two seconds later and the crest would have them in its curl.

Below, you have a similar situation. Note the smooth water to starboard of the surf boat. Assuming there's nothing dangerous coming to seaward of this area, it would be the preferred crossing spot. However, as these photos are taken at the Coast Guard training facility at Ilwaco, Washington, on the Columbia River bar, they are looking for difficult wave patches.

The image above shows the minimum forward position relative to the breaking wave face. And this is on a small crest. If the crest were even a couple of feet (600 millimeters) larger, serious damage would result on other than a boat built for this service. Note the next crest in the background. The bottom here must be relatively even in depth, and once the waves start to break, they roll in a long way. This guarantees you will be meeting one or more crests as they are breaking, and makes it much more difficult to pick the right spot at which to intersect a wave.

Below a bit of garbage water left over after a breaker has passed. This is not dangerous, as long as correct heading is maintained and the boat does not get sideways.

On the way in, above: Staying on the back of the crest, making sure not to get the nose too far over! Below, Professional drivers are at work...don't try this on your own. These boats are designed to skid side-ways in the crest reducing the odds of rolling completely. However, on a larger wave the risk of a rollover goes up dramatically. In a yacht, with a keel, the boat would already be parallel to the water.

van der Wal/Stock Newport

The light displacement yacht No Problem entering Ala Wai Yacht Harbor, Honolulu, Hawaii. The trades often create a breaking sea pattern at this entrance, and all sorts of boats deal with it successfully. The key is to take your time, watch the wave sets, and make sure you pick a small set to ride in, as No Problem is doing here. The water on either side of the pass is quite shallow, and good steering control is required on the wave face to avoid broaching and to stay in deep water.

Sundeer at the entrance to Tracy Arm in Alaska.

CRUISING WITH ICE

We were walking back from Port Hardy on the northern end of Vancouver Island one afternoon when we saw a most interesting Coast Guard vessel.

Gordon Reid was one of a new class of Canadian Coast Guard rescue cutters. With her pronounced freeboard forward, huge bridge, massive aft deck and attendant cranes, she looked to be a very fit vessel for the purpose.

I should digress to tell you that we've always dreamed about cruising the higher latitudes. There's something about the remoteness, the wildlife, even the challenge in the weather that is an attraction. But for us, by far, the biggest pull is ice. The colors, shapes, and power represented by sea ice is the ultimate draw.

Of course this is easy to talk and dream about. Doing something about it takes time, planning, and some degree of courage. That's why reading about the high-latitude adventures of others has always held such a fascination.

It wasn't until the summer of 1991 that Linda and I decided to visit British Columbia and Alaska. That decision, as with so many of our cruising plans, was a last-minute switch. Instead of going to the South Pacific we'd head north!

Since we were getting a late start and wanted to get a feel for the area, we decided to look on the cruise as a reconnaissance trip. We would see as much as possible, and leave the leisurely cruising (if we liked the area) for future years when we could pick and choose among the many attractions with some degree of knowledge.

It was a fascinating experience, and along with getting a feel for a new type of cruising, and the seamanship that goes with it, it was our first experience with ice.

Which brings us to Tracy Arm.

Help

John Muir referred to the wonders of Alaska's Tracy Arm as "a Yosemite with water." He was certainly right about that. And, we might add, without the tourists.

Picture yourself in one of the most wondrous spots on earth, a huge glaciated valley, surrounded by precipitous cliffs thousands of feet high. Waterfalls plunged on so vertical a course that we could put *Sundeer's* bow under the bottom of the fall to clean her muddy anchor.

On all sides were wonderful glacial carvings on the rock walls, with pockets of fir trees adding touches of color here and there.

Every now and then a valley would branch off to the side, hiding all sorts of undreamt-of treasures.

Imagine winding your way through ever-growing pieces of ice, recently calved from the glaciers at the head of Tracy Arm. Many of these newly created chunks were longer and taller than *Sundeer* (and that's the part we could see—the other 90-percent was below the surface) showing aquamarine against the greenish-white of the glacial water through which we cruised.

Conning our way through ice is much the same as working in coral. Height helps, so we stand on top of the pilothouse. You need the right equipment too—in this case lots of layers of warm clothing!

Jagged arms held out a warning to us: "Keep your distance," they seemed to be saying.

Older pieces were more rounded, sculpted into fantastic shapes by the sun and wind. Here was a graceful swan, and there, a bust of President Lincoln.

Some of the ice was stark white, while other pieces were a dark, milky brown.

Envision all of this majestic scenery and then add one more thing: it is all yours. There's not another boat in sight to share it or break the mood.

Anchored at the entrance to Tracy Arm later that evening (there's little bottom to be found under 100 fathoms for much of the arm, and most is

Waterfalls were so plentiful and the approaches so deep that we got into the habit of putting Sundeer's bow under a waterfall to wash her anchor. The force on the larger falls is enormous and would quickly push us back or to one side.

Elyse and Linda check out another fall (top, opposite page) before retreating to the cockpit.

deeper than 200 fathoms!) we were all quiet aboard *Sundeer*. Each of us was thinking about the day's experience. There was something magical about what we had seen, and none of us wanted to let go of the experience.

For me, the key lay in the ice. I knew then, and know now, that we will be back for more.

"So," I thought to myself when I saw that Canadian Rescue vessel, "I'll bet someone aboard has some ice experience."

Upon hailing the bridge a young officer steps out and looks down at us. "What can I do for you?" he asks.

"Is there someone aboard who might answer a few questions about cruising with ice?" I answer.

"You want the first officer," is his reply. "He'll be along in a minute."

And so we meet Captain David Snider, the man in charge of this most impressive-looking cutter. He has more than a dozen years of high-latitude coast guard rescue experience, much of it on ice breakers.

Captain Snider is all professional, from the crisply pressed uniform to his authoritative answers to our myriad of questions. Here is a gold mine of information, ours for the asking!

My first questions deal with how to tell when ice is near.

Never Run at Night

"To begin with, *never* run at night" he tells us. "We don't even do that in a 60,000-horsepower icebreaker."

"Yes," I go on, "but what about in a medical emergency?"

"It is the same thing as running at night in reef-infested waters," he explains, "Would you do that in the same situation? That's the way to look at it."

In other words, if the emergency is great enough to risk the ship and her crew, okay.

Ice Forecasting

"How can you tell when ice is near?" I asked next.

"First of all, you have the ice warnings broadcast by the US and Canadian Coast Guard," is the reply. "In the North Atlantic, as a result of the *Titanic* disaster, the US started an international ice patrol which now has ships and aircraft surveillance. Of course, in the southern hemisphere, off Antarctica, there are no warnings."

Big Bergs

"When there's a large berg in your vicinity, it will affect water temperature. If you're monitoring the temperature the drop will let you know that there's ice near you. You'll frequently see small bits of ice floating ahead of the larger bergs and pack ice. That is another good clue. You rarely come upon a berg just on its own, without warning."

At the head of the bay, with the Tracy Arm Glacier in the background.

While everyone likes to get a close look, maintain a prudent distance, lest a large chunk of glacier suddenly calve. The big pieces create large waves that could easily swamp a small boat.

This ice looks pretty thin. Most of the pieces appear to be less than 4 feet (1.2 meters) deep. And it isn't solidly packed together either.

Yet there is enough resistance here to stop Sundeer's 30 tons like she was an inflatable dinghy.

Pack Ice

"If there's pack ice about and you're to leeward of it, there will be a dramatic calming of the sea, just like if you were to leeward of a reef. When you are to windward of pack ice, the sea will be rougher, more confused by the reflected waves.

"We always look for ice blink. This is a reflection from the ice on the underside of the cloud layer that is almost always present in higher latitudes. Even when the sun is weak, you can see a white glow under the clouds. In areas of open water the clouds will be much darker on their underside.

Using Radar

"Radar will show you the big pieces when a sea is running, but the smaller pieces, which can still do a lot of damage, will be lost in sea clutter. In smoother water the smaller pieces will show up.

"You want to get as high as possible to watch for the ice. We put someone on top of the bridge in bad conditions.

"If you are caught at night, using a powerful spotlight mounted high will help a great deal, but it is not foolproof. One thing you've got to be very careful about is black ice. The bits which have been on the beach for awhile will be brown and very difficult to spot."

We get the feeling the Captain Snider could probably smell ice when he was near it!

Types of Ice

"You need to understand what type of ice you are dealing with," he goes on. "There are two basic types, the icebergs which are calved from glaciers, and pack ice. The calved bergs are the big pieces, sometimes miles long. In fact there was once a piece something like 89 miles long. These are called 'table bergs.'

"The biggest bergs break off of the Antarctic continent and are found in the Southern Ocean. Those which are found in the North Atlantic come from Disco Bight glaciers in Greenland. They find their way down the Davis Straits into the North Atlantic.

"The North Pacific doesn't have much of a problem with icebergs. Most of these are trapped in Glacier Bay, and those that do escape are quickly melted by the Japanese Current.

"In the North Atlantic, the ice reaches the Gulf Stream, and then follows it across towards Europe, melting all the while. The location of the ice and the Gulf Stream is affected by time of year. In the winter they both move south and then in the summer north."

"Is there a difference between glacial ice and pack ice?" Linda wants to know.

Keeping watch:

Radar will do a good job picking up large bergs at a distance. However the smaller bergy bits will rarely show up in the sea clutter presented by a normal Force 4 or above sea state.

If ice is about, while it may be unpleasant, it is necessary to have a pair of eyes on deck at all times.

Icebergs

"Berg ice is more jagged, and much denser," is Captain Snider's reply. "The pressure of the glacier condenses the ice, and the calving process produces the jagged edges. It is much more dangerous. Pack ice isn't as thick or as hard, although it can still open up your bottom. But it doesn't usually have the jagged spurs of the bergs.

"Because the 'bergy bits ice' is denser," he goes on, "it sits lower in the water. That makes it harder to see."

The current at the head of Tracy Arm had pushed *Sundeer* into a rather crowded area of ice, almost like the beginning of a pack ice. We'd had to bull our way through the ice to get out. Every now and then we'd hit a small-sized piece which would stop us dead in our tracks. With a little more way on, we found that *Sundeer's* bow would ride up onto the ice and then break it in half as we pushed through. When we felt a piece of ice to be near the prop, we put the engine into neutral, and overall we'd gone very, very slow.

Of course this was a very small area of less than 50-percent pack. I was curious about what the correct tactics were.

Tactics in Ice

"No matter what," emphasizes Captain Snider, "always keep movement on. Otherwise the ice will begin to close in around you. Then you'll be nipped (caught in the ice)."

"Yes," I ask, "but what about damage to the propeller?"

"If you stop the prop, the ice will build up under the bottom and around the prop. When you start up again you'll really have damage. Besides, if you get caught in the ice you're dead meat anyway.

A really stupid idea! We got out in the inflatable dink to take photos of Sundeer, with ice in the background. This meant threading our way carefully through the small bits surrounding the boat.

Many of these pieces are unstable and flip over without warning, or have jagged edges sticking out just underwater which would make short work of our dink.

We got the photos without incident, but would not try this again!

"The basic rule is keep clear. Even the big icebreakers don't want to get caught in the ice."

In other words, it is better to chance some damage to the prop and get into clear water than chance being caught in the ice. Even if the prop is bent up somewhat, you can still turn it at slow revs.

Carry a Spare Prop

On the subject of props, Captain Snider continues, "It is a good idea to carry a spare wheel. If you have a variable pitch prop you can carry a single spare blade. That's what we do. I don't like controllable pitch props because if you damage them the odds are you are going to damage the internal pitch control shaft as well, and that is something you can't repair in the field."

Hull Shape

"What do you do if you are caught?" Elyse asks.

"You want to be sure you have a round bottom and no projections on the hull. This way the ice will have a chance to push you up and onto the pack, not crush the boat. Any sort of chine or appendage, even a keel or rudder can trap you. Sometimes if you roll the boat from side to side you can free up the ice enough to get you moving again. Otherwise you better be prepared to spend the winter! And you better have first-class radio capabilities to call for help."

Using Prop Wash

"When you're pushing your way through the ice every now and then you're going to hit a piece which begins to stop you and swing your stern this way or that. When this happens, you have to use your engine, so swing the stern *away* from the ice. We have twin engines to do that with. You have to use your prop wash and rudder. What you're worried about is the jagged, underwater edges ripping along the hull side. They are just like a can opener. Always take the ice on the bow, not the side. Even a glancing blow can do substantial damage on the hull side, especially with bergy ice."

"What sort of preparation do you suggest?" I ask.

"A heavier-duty prop is a good idea. We use winter and summer propellers on our rescue vessels. A spare wheel, and supplies to last the winter if you get stuck. But most important, stay out of the ice!"

I'm sure we could listen to Captain Snider for the rest of the day, but he has his shipboard duties to attend to and we ours. Reluctantly we take our leave.

Waterpump Impellers

From a professional fisherman who works Alaska in the winter, sometimes in the ice, I learned that most boats that spend time in ice replace their rubber impeller pumps with pumps that use metal impellers. Seems the little bits of ice chew up those rubber impellers pretty quickly.

Offshore Ice

The issues with ice offshore are quite different. Where with some high-latitude coastal cruising it is difficult to avoid ice-infested areas, once you head offshore this becomes easier (and at times a necessity).

Warning Signs

Along with the signs of ice already discussed in the previous section, there are several other precursors when you are offshore.

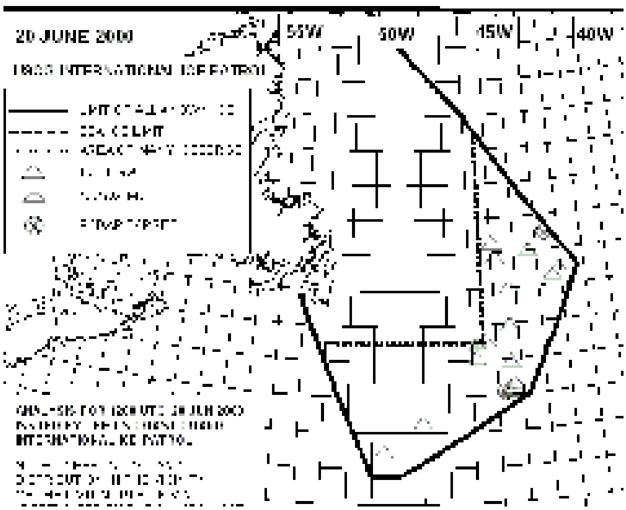
An iceberg acts like an island. Waves reflect back to windward, circle around and become confused to leeward, and calm the sea when approaching from downwind.

On a clear day with good visibility, a large berg can be seen at 15 to 20 miles. As visibility drops and fog picks up, you may not see a berg until you are within a quarter of a mile or less.

On a clear night bergs can be seen at three-quarters of a mile to 3 miles.

Bergy Bits

The big bergs are not what we cruisers are worried about, as they are relatively easy to spot on radar. Of larger concern for us are the



Ice forecasting:

Fortunately, there is a wealth of ice data available from the US Coast Guard, NOAA and other organizations. Satellite, ship reports and overflights with long-range aircraft combine to make for relatively thorough reporting.

In the US this data is combined into reports issued by the National Ice Center (NIC), and is available on a daily, weekly, monthly, and seasonal basis, both in broadcast form (via weatherfax) and via the internet.

Of particular interest to cruisers, usually those making the trip from the US to the United Kingdom, is the location of any large bergs or areas of broken ice heading down from the higher latitudes.

The chart below can be seen on the internet at http://www.uscg.mil/lantarea/iip/pics/iipfax.gif.

Help

Below is a typical text broadcast for ice conditions.

SECURITÉ

1. 21 JUN 1200 UTC ESTIMATED LIMIT OF ALL KNOWN ICE:

FROM 4637N 5332W TO 4600N 5230W TO 4330N 4530W TO 4400N 4430W

TO 4730N 4215W TO 5200N 4700W TO 5600N 5300W THEN NORTHWARD.

ICE LIMIT NORTH OF 52N IS OBTAINED FROM CANADIAN ICE SERVICE.

2. MANY ICEBERGS ARE NORTH OF 4530N AND WEST OF 4630W.

3. USE EXTREME CAUTION WHEN NEAR THE GRAND BANKS AS ICE MAY BE PRESENT. REPORT POSITION AND TIME OF ANY ICE ENCOUNTERED TO

COMINTICEPAT VIA CG COMMUNICATIONS STATION NMF, NMN, INMARSAT

CODE 42, OR ANY CANADIAN COAST GUARD RADIO STATION. MAKE UNCLASSIFIED SEA SURFACE TEMPERATURE AND WEATHER REPORTS TO COMINTICEPAT EVERY SIX HOURS WITHIN LATITUDES 40N AND 52N AND LONGITUDES 39W AND 57W.

4. ICEBERG CHART FACSIMILE BROADCASTS ARE AT 1600Z AND 1810Z ON FREQUENCIES 6340.5, 9110.0 AND 12750.0 KHZ.

smaller pieces which may stick out of the sea just 3 or 4 feet (0.9 to 1.2 meters). These can weigh several tons and can easily damage a hull.

Because they are so small they are difficult to spot, especially with a sea running, when they tend to get lost in the crests and foam of the waves.

Iceberg Drift

Iceberg drift is affected by both current and wind. With 90-percent of their area below the surface, currents often have a much bigger impact than wind.

However, the harder it blows, the more influence wind will have.

Coriolis also has an impact. The rotation of the earth gives a clockwise bias to drift in the Northern Hemisphere, and counterclockwise bias in the Southern Hemisphere.

Finally, to the extent the sea surface is tilted as the moon and sun create tides, there is some downhill gravitational force working as well.

How do all these factors mix? That is hard to predict. However, you can, to some degree, quantify the factors.

Lots of current and light wind obviously means that current will have the upper hand. Lots of wind and light current means wind direction, vectored somewhat by coriolis forces, will predominate.

So, listen to the ice forecasts on the single sideband radio, watch your weather forecast, and keep your eyes open!

Hard Core Cruising With Ice

The type of cruising, and comments which you've just read, are based on what we would call casual cruising with ice, i.e., the odd trip now and then to the North in summer. But what if you are early in the season, or further south in the Southern Ocean or Antarctic?

The following photos and comments come from Hamish and Kate Laird, who have more experience cruising in the high latitudes—specifically at the bottom of the planet, than just about anybody we can think of (you will find general comments from them on the seamanship starting on page 626).

The data which follows is obviously based on extreme conditions. However, there are lessons to be learned here for the everyday sailor as well. Kate and Hamish Laird's suggestions follow:

The Right Clothing

If you have to sail in the snow then having the right gear makes all the difference. Breathable foul weather gear is excellent in these conditions. Probably the most difficult thing to get right is the choice of gloves. The helmsman can get away with large ice climbing mitts but for sail handling you really need gloves; fishermen's gloves are excellent and have a built-in lining for warmth but once wet are difficult to dry. Regular rubber gloves are not bad as a polypro or meraklon liner can be used inside that is easy to remove and dry. Full-fingered sailing gloves (the "frostbite" type with neoprene backs) are very cold once wet, though a dry pair can be

Hamish Laird

Anybody for a nice afternoon sail? Summertime sailing gear in Antarctica.

If you have the right clothing, cruising in this environment can be exhilarating, and you are guaranteed the anchorages won't be overly crowded.

handy for delicate work on deck...as long as you have a chance to warm your hands up afterwards.

In driving snow, goggles are a must. In bright conditions, especially with snow and ice around, mountaineering sunglasses (with the leather side-pieces or tight wrap-around styles) keep away headaches.

Beating to windward in the Southern Ocean, particularly with hanked-on sails, the one-piece dry suits are marvelous. (she's only tried the Musto HPX version and lived in it for 40 days while doing the Sydney-Cape Town leg on the BT Global Challenge). On *Pelagic*, with roller-furling headsails and a distaste for beating to windward, we never wore the dry suits on deck, though we often wore them in the dinghy when going ashore in difficult conditions.

Windblocker fleece balaclavas are very good, and a balaclava can't blow off.

Feet are another problem area. Kate has had a bout with trench foot from too long with wet feet in near-freezing conditions—it's like frostbite but without the actual crystallization of the flesh, but very painful nonetheless. She has Goretex "Rocky Socks" which are waterproof socks that go over wool climbing socks, so that even if her boot fills, the socks remain dry. We have two pairs of seaboots on board. The warm ones are Canadian rubber ice fishing boots, with thick felt/aluminum liners (sold by LL Bean as "SubZero pack boots"). These are superb for going ashore and gentle conditions, but too slick on the deck for rough weather. We both wear Chameaux boots in heavy weather, but Kate wears a pair three sizes too big and uses the SubZero pack boot liner inside.

Help

Hamish Laird

A large tabular iceberg in the Southern Ocean. These can be found well away from land and even north of the convergence zone.

Hamish says "Although the probability of seeing one diminishes rapidly the further north one goes from Antarctica the danger is still there so a good watch should be kept, especially if you are sailing in an area where the current could sweep one of these behemoths up to lower latitudes. Radar is very good at spotting these big bergs and should be used regularly, especially at night."

For the rest, we wear fleece expedition weight thermals (Polar tech 100 or equivalent, which is much more comfortable than polypropylene) and Polar Tech 200 or 300 trousers or salopettes and a jacket on the top. Hamish has the Musto mid-layer with the nylon outer shell, which is useful to cut the wind while in harbor, but at sea one always has foul weather gear on anyway, so the shell isn't critical. In very cold weather, we have mid-weight thermal underwear to go under the expedition weight for a third layer.

Never Take Anything for Granted

By now you may be getting the idea that there is little to trust when navigating in difficult situations. We've arrived at this approach from experience, having seen too many situations where we could have gotten in trouble by relying on supposedly accurate data—either printed or local wisdom—and too many instances of acquaintances getting into difficulty by being too trusting.

Some call us paranoid, and perhaps they are right. But when you sail without insurance, and your boat represents a large percentage of your net worth, an overdose of caution is warranted.

On the other hand, we don't want to scare anyone into thinking that cruising is so dangerous that you should just stay home. While there are risks, as with anything in life, these are quantifiable, and *almost always within your control*.

Help

Compare cruising to driving down the freeway after 2200 on a weekend: you can feel much safer and more in control on your boat, than worrying about a drunk driver crossing the center divider.

But while the likelihood of the drunk hitting you is remote (there are 35,000 deaths every year in the US caused by drinking and driving!) most people still drive even more cautiously during this time of night than otherwise is the case.

That brings us to the rest of this section.

As we have reiterated now several times, our approach has always been to *never* take anything about navigation, weather, or the boat in general, for granted.

We prefer to always look out for the unexpected. Maybe one of us has made an error in plotting our position. Perhaps we've misread the GPS coordinates. We might mistake a light on shore for a sea buoy.

By always questioning what we see, hear, and feel, and never taking anything for granted, we are better prepared when the inevitable mistake occurs.

Using Your Senses

We've briefly discussed the use of your senses of hearing, sight, and smell in the previous section. We want to come back to this once again for just a moment to emphasize how much data is available when you are on deck.

But if you are below, under a dodger, or in a pilothouse you cannot hear or smell what is going on outside. Vision is impaired as well.

The vast majority of yachts that hit reefs do so without a watch on deck. With one exception, every story we've heard of someone losing their boat on a reef had the crew below. In the one exception there was a group of people in the cockpit, under the dodger.

In all of these cases, had someone been standing on deck knowing what to look for, they could have taken evasive action in time.

Knowledge Standards

Local wisdom varies in quality. When someone says to you, "Sure Captain, there's plenty of water in here for you," he may be thinking you have the same draft as his flat-bottomed fishing boat.

The same applies to the data coming from other cruisers. You may need to ask yourself how experienced they are. Is their information based on firsthand observation, or is it being passed on?

Our own preference is to have a cruiser with whom we are familiar give us a "heads up." In the process of discussing the data, we always like to get as many detailed answers as possible.

Rather than accept "Just look for our masthead light and come on in," it is better to find out the water depth, how far away any obstructions are from the anchored boat, and just how well they have looked around since anchoring.

ANCHORING

Hanavave on the island of Fatu Hiva in the Marquesas (French Polynesia) gets our vote as the most beautiful anchorage in the world.

Holding isn't too bad, it is deep, and there is typically a nice breeze down the valleys in the evening (something which is typical of valley openings).

*The only negative is that it is an open roadstead. And when the trades are pumping, it does get rolly (see page **420** for information on how to deal with rolly anchorages).*

The sound of chatter on *Intermezzo's* foredeck cuts through the fog of my afternoon siesta. Anchored snugly in Taiohae Bae on Nuku Hiva Island, a port of entry for the Marquesas Islands, I am taking a well-earned rest. After all, I say to myself, have I not just navigated us to a perfect landfall after 2,800 miles of ocean?

Respect for this accomplishment is singularly lacking in the crew as the younger members excitedly announce the arrival of a new yacht. Consoled by the thought of the fresh limeade I know Linda has in the fridge, I pick up visor, sunglasses, and suntan lotion and work my way towards the deck.

Adorned with proper accouterment for tropical paradise, I look to port and sight the new arrival. The reason for the excitement is immediately apparent. An honest-to-goodness gaff-rigged Colin Archer ketch has just sailed her way into the anchorage. Far from equating such a rig with inefficiency and hard work, Elyse and Sarah (ages 7 and 4 at the time) have visions of bearded pirates, cannons, and broadsides.

The skipper, whom we shall call George, drops his hook to windward and just inshore of us. While he secures his little ship I go below for that pitcher of cold limeade. Elyse and Sarah are summoned to row some of this local libation over to our new neighbor.

As I come back on deck I am surprised to see our salty-looking neighbor abeam. "You're dragging!" he hollers over.

Help

Having just set our anchor with full reverse in a hard mud bottom, I find that a highly unlikely event and say something to that effect. George answers back, “But I have let out 50 feet (15 meters) of chain, and the water is only 40 feet (12 meters) deep.”

After gently suggesting he try letting go another 150 feet (46 meters), I send the kids across with our peace offering. The zip in our limeade does the trick (along with a little extra rode), and he fetches up hard against his anchor.

At dinner two evenings later our new friend allows as how this is the first time he has ever anchored! All of his previous experience had been with docks or moorings.

As we have come to find in subsequent anchorages, this is not an unusual state of affairs. Anchoring is one seamanship technique at which many of us get little practice. Much of the time yachts sit at moorings or in slips, and when we do set out for a weekend away, it’s off to a reserved space at another marina dock or yacht club. When the time finally comes to get off by ourselves and enjoy the quiet of a secluded cove, anchoring skills are rusty at best.

Cabo San Lucas

Before going further into the subject of defensive anchoring we want to take you back to Cabo San Lucas, on the tip of the Baja Peninsula, during the winter of 1982.

At this time, Cabo was a picturesque Mexican village (now it is a city with lots of high-rise condos). For generations it has been a favorite of mariners traversing the Mexican coast.

If the winds are light in the Gulf of California, Cabo offers good protection from the prevailing northwesterlies blowing on the Pacific Ocean side of Baja. But if the Northers are blowing in the Gulf of California, the open roadstead fronting Cabo San Lucas gets quite rolly.

The water is deep to within 500 feet (140 meters) or so of shore. Then the bottom shelves rapidly to a shallow depth.

The favorite area to anchor is on the western side of the beach, close to the harbor entrance, and a short dinghy ride from town. The bottom offers moderate depths further from the beach to the east, but this makes for a long (usually wet) ride into the inner harbor.

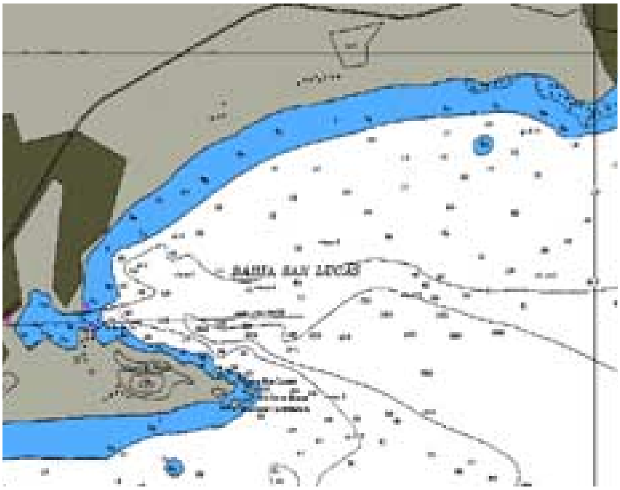
In early December of 1982, there was a large flotilla of cruising sailboats and sportfishing yachts, around 60 vessels in all, anchored in this area, mostly using bow and stern hooks to hold position and keep their bows into the swells.

During the afternoon of December 8, the sky changed from clear to heavy cloud cover and the barometer dropped a couple of millibars, continuing a decline from the previous day. The wind was light and variable.

Several sailboats arriving in the anchorage during the afternoon reported uncomfortable southerly swells during the last part of their passage south from Magdalena Bay.

The data which follows is based on our own notes taken as we passed through Cabo seven weeks after this mishap, as well as from material which appeared in *SAIL* and *Latitude 38* magazines.

The tip of Baja provides little shelter, except for the indentation at Cabo San Lucas. If the Gulf of California is windy, the swells roll down the east coast and into the anchorage at Cabo. Rolling is a problem and a lot of boats anchor bow and stern to keep their nose headed into the seas.



On the 0530 weather broadcast from the high seas radio (KMI) a tropical disturbance was reported 300 miles to the southwest, with gale-force winds extending 100 miles from the center. The only problem was nobody in Cabo heard the forecast.

The day turned out to be hot and sultry. High humidity is unusual in Cabo in the winter. Around midday a brief but intense squall struck with winds from the southwest, rotating to the southeast. Fifteen minutes later the squall was gone, but a hint of a swell started rolling into the anchorage.

The exposed nature of the anchorage; the shape of the sea bottom as it approaches the shore; the unusual humidity; the drop in barometric pressure; and the squall were all signals that something was brewing—ample warning for those practicing defensive seamanship to put to sea or find a more secure anchorage.

Susan Mitchell, a ham radio operator on the schooner *White Squall* had a 1600 schedule with a sportfishing boat en route from Magdelana Bay to Cabo. The sportfisherman reported that his weatherfax showed an area of bad weather offshore, between Cabo and San Diego, with gale-force winds predicted to blow from the southwest in the Cabo area. During the 1630 local net Mitchell repeated this data.

The winds in the bay were now puffy from the southwest. They were blowing 15 to maybe 20 knots, with a moderate wind chop and southwesterly swell rolling into the anchorage.

A few of the boats discussed the weather on VHF debating if they should leave. With just a couple of exceptions, taking comfort from each other, they decided to stay at anchor.

A few hours later, by early evening, it was blowing harder, the seas were building, and boats began to drag. Some boats which had been fine on their own found themselves in trouble due to other vessels dragging down on them.

Help

Larry Pardey

Many of the boats that went up on the beach would have survived if they had been alone in the anchorage. But as you can see above, the sea often tossed one boat on top of another, causing them to grind each other to pieces.

By 1900 Bernard Moitessier's red-hulled *Joshua* had been driven ashore. She had been anchored just 75 feet (24 meters) off the beach, with a line ashore to hold her into the wave direction.

By 2000 the winds were blowing 35 knots, directly onto the shore. Seas were in the 8-to-12-foot (2.4-to-3.8 meter) range, and breaking several hundred feet from shore. Squalls were occasionally hitting the fleet as well.

The boats closest to the beach soon found themselves in the surf line. It was dark now, and difficult to see where to maneuver and how to work their way out of the anchorage. Some of the boats trying to use their engines soon found their own stern anchor rodes or the rodes of other boats wrapped around their props. A few of the boats anchored further from the beach retrieved or slipped their anchors and put to sea.

For the boats anchored in sufficiently deep water with good ground tackle, December 8th would be a night of high anxiety but nothing more. Eric and Anit Broenimann on *Kaselot*, a 34-foot (10.2-meter) sloop were anchored in 40-feet (12-meters) of water. They had 240 feet (72 meters) of 3/8-inch (0.9-centimeters) chain attached to a 35-pound (15.8-kilogram) plow on the bow, and 110-feet (33-meters) of line and 40 feet (12 meters) of chain attached to a 25-pound (11.3-kilogram) plow on the stern. Although they were awed by the size of the waves and concerned

Help

Larry Pardey

All of the carnage shown in these photos—and this is just a small percentage of it—could have been avoided if those anchored had moved out to sea at the first hint of trouble.

It simply does not pay to take chances in an exposed anchorage.

the anchor might not hold, they took no breaking waves over the boat and made it safely through the night.

Another boat that fared well was *Magic Dragon*, Coff and Barbara Buckhardt's Valiant 40 (12.2 meters). In 35 feet (10.5 meters) of water they were anchored stern-to the seas, a position they liked. They had 200 feet (60.9 meters) of 5/16-inch (0.8-centimeter) high test chain attached to a 44-pound (20-kilogram) Bruce anchor on the bow, and 60 feet (18.2 meters) of 3/4-inch (1.9-centimeters) nylon and 150 feet (45.7 meters) of 5/16-inch (0.8-centimeter) chain attached to a 20-pound (9-kilogram) Danforth on the stern. Cold, wet and terrified, the Burkhardts adjusted the anchor lines every half hour to avoid chafe and did just fine. They took an occasional breaking wave, but these were few and far between.

In evenly-spaced intervals, 26 other boats would either sink or go ashore that night, with the last hitting land at 0200. Initially the VHF radio was alive with Mayday calls, but after about three hours transmissions ceased as people realized that nobody could help them. Everyone was on his or her own.

For many boats anchored inside the surfline, neither the wind nor the seas were as great a villain as the fleet's own imprudent anchoring practices. Driven by the desire to get a spot as close to the beach as possible, the boats were anchored as they always are at Cabo, ridiculously close to one another and to the beach.

Help

Larry Pardey

Phe Laws was on the Force 50 (15.2 meters) ketch, *Breaking Free*. "At first we had a wide area to ourselves. Then the ketch *Pisces* anchored parallel; later on *Anona II* and *Wilbur* anchored between the two ketches. Next a fishing boat anchored off our starboard side and a trimaran off our bow. Competition for space within easy reach of the beach was strong, and too many boats were crowded together. *Breaking Free* was boxed in."

As the wind and seas grew, rodes were pulled taut, and boats swung in bigger arcs. The result was predictable. "We were about to blow into *Pisces*. All possible adjustments were made, but it was already evident our bow anchor chain might be under *Wilbur*'s. At first the crews worked to fend off contact with the other boats, but that didn't last. After a while the wave action was so intense that boats were taking turns crashing down on each other. Stanchions and safety lines were ripped out, the taffrail was gone from *Breaking Free*, and the bowsprit on *Pisces* was broken."

One key factor in how boats fared once they were aground is how far out of the surf they were pushed. Another was internal water and debris damage. If hatches and ports hold and the interior stays dry, the odds of salvaging a viable boat are much greater.

Over on the Tayana 37 (11.2 meters), *Sea Wren*, things weren't much better. Jerry Steren remembers, "We were only concerned for our lives. The ferrocement boat *Jolina* was anchored off our starboard beam and was doing the same violent dancing we were. Standing in the cockpit we could sometimes look and see *Jolina* 20 feet (6.1 meters) above us. She kept coming closer and closer until she was just 4 feet (1.2 meters) away. Fearing that she'd land right on top of us, we went below and lay on the floor beneath the salon table. Actually, if she had landed on us, lying under the table probably wouldn't have done any good." (The crew of *Jolina*, after an hour sawing through their anchor chain, made it out to sea and safety).

Larry Pardey

Bernard Moitessier was so depressed by allowing Joshua to go ashore that he walked away from this stoutly-built steel vessel. He gave Joshua to a couple of Scandinavian sailors, if they would take responsibility for her salvage. After substantial effort Joshua was refloated and is still cruising today—a testament to determination and metal construction.

Collisions and the tangling of anchor chains were commonplace throughout the anchorage. On numerous occasions one dragging boat pulled several others ashore.

"When in doubt, get out," is time-honored advice for sailors at anchor. But at Cabo it was only followed by the few who left at the first signs of the blow, not those who succumbed to the weakness of waiting to see if things wouldn't get better before they got worse. Hesitation was deadly because as soon as the wind built, the bay became polluted with debris that could foul a prop or clog a water intake: flags, sheets, abandoned anchor lines, punctured inflatables, towels, sail covers, sleeping bags, tie-downs—everything. It was estimated 50 boats had fouled props by morning.

After suffering several collisions, *Breaking Free* tried to motor out. She was successful for awhile, but out near the "Arches" on the southwest corner of the bay, the engine quit. When Phe Laws opened the bilge it was full of acrid black smoke. Although the engine had restarted, something was apparently in the prop, and it again died. Unable to get their last anchor out in time, *Breaking Free* drifted into shallow water and disintegrated into small pieces over the next few hours.

But even an operating engine was no guarantee of safety. Bob Lockhead, who had only recently arrived in Cabo after a long sail, tried to power his boat out of the surf line. He was able to make it a mile or so parallel to the beach, but could never punch through the surf line to deep water. He went on the rocks, just a few hundred yards past *Breaking Free*.

Help

Sea Wren's Song

The following comments are from the log of Gail and Jerry Sieren, of the yacht *Sea Wren*.

Noon—25-knot squall comes through and boats drag. Afternoon spent perfecting anchoring arrangement: one 45 pound (20.4 kilogram) CQR off bow, small anchor off stern, another 45 pound (20.4 kilogram) CQR off side of stern to keep away from another boat. Chafing gear put in place, lines flaked for additional scope, machete ready to sever lines if necessary. Single mistake: only in 15 to 25 feet (4.5 to 7.6 meters) of water.

1300 to 1600—Horizon is dark and unsettling. You could tell there'd be action during the night.

1800—Eat dinner in cockpit because growing swell makes it too uncomfortable below.

1830—in 15 minutes winds have grown from 0 to 35 knots. Swell is rapidly growing.

1915—Bernard's *Joshua* is first boat on beach. Others follow almost immediately.

2000—Wearing wetsuits, we steer to keep clear of other boats and keep bow pointing at waves.

2015—Prop fouls, engine inoperative.

2045—Seas begin breaking over boat, maybe 15 feet (4.5 meters) high. Boat wiggles frantically when struggling through white water of broken wave. Shoreside witnesses say *Sea Wren* pitches at 45 degrees each side of vertical.

2100—After tying down wheel for a few moments, discover both bronze arms on worm gear have broken. No engine, no motor, can only hope anchor holds. Why not swim to shore? Too much fun riding waves, like an E-ticket at Disneyland.

2115—Companionway jams shut with both of us inside. We beat open the hatch with dinghy anchor, in process get briefly seasick.

2130—Achilles inflatable blows away when D-ring pulls out.

2145—Still confident. Figure just in for a long night.

2200—Particularly big wave washes dodger away.

2215—Jib bag blows open and sails fly up on *Sea Wren* and nearby *Ayorama*. *Ayorama* takes off toward shore like a rocket. Fear is our anchors are tangled—they're not. *Sea Wren* is still riding it out.

Larry Pardey

Going aground in the surf is the ultimate test of structure. This boat didn't make it. The hull actually split along a bulkhead, probably due to not taping additional reinforcements under the bulkhead.

Help

Larry Pardey

2300—Still holding, all is well.

2315—Moored powerboats are getting farther away, shore closer. We're going to beach.

2345—There is a series of surprisingly soft thuds as boat bounces onto the beach. Half Mexican, half American crowd on shore screams "jump" and "don't jump." Crowd panics us, we jump prematurely, and make it to shore.

0030—Waves have pushed *Sea Wren* way up on beach beyond reach of most waves. No obvious damage, looks like ideal candidate for refloating the next day.

0130—Walk to Las Palmas for coffee with owners of *Ayorama*, whose boat is also high and dry and looks good for salvage.

0230—Back to boat, discover a small dam above beach has burst, sending trees, logs and other garbage down on *Sea Wren*. She's been pushed back in the surf together with the Valiant 40 *Tempus*. All her bulkheads have broken loose, and she is a total loss.

What makes a boat salvageable:

- ❏ Strong construction.
- ❏ Being pushed high up on the beach, away from the pounding of the waves.
- ❏ Deck hatches and ports remaining watertight, and interior remaining secure from water and sand.
- ❏ Not having another vessel land on top of you.
- ❏ Luck.

Lessons

All of the sportfishing boats which had been moored in deep (90-foot/28-meter) water came through unscathed. Twelve sailboats remained at anchor, while 12 to 15 boats escaped to sea. And the rest? The remains of 22 cruising boats, along with a smattering of smaller local craft lay on the beach, for the most part destroyed.

Whether or not many of the sailors in the area learned any lessons from this debacle is an open question. We cruised through Cabo on *Intermezzo*

Help

Larry Pardey

II, a couple of months after the disaster. Boats were once again anchored chock-a-block in the same area, using bow and stern anchors, just as vulnerably as their predecessors whose remnants now crowded the beach in front of the high-class tourist hotels.

A series of valuable lessons can be learned from this disaster. First, as we've already said, if at all in doubt about the anchorage, put to sea earlier rather than later. Heaving to offshore for the evening or seeking an alternate, safer anchorage is far more comfortable and restful then pitching and heaving at anchor, with a lee shore a few yards off, uncertain whether you will make it through the next few hours.

Second, avoid the crowds when an anchorage has high-risk factors. It is more often than not the neighboring boats which start your problems. Be wary of using stern anchors in crowds, or in an anchorage where you may have to exit quickly. Having stern rodes foul props is a common problem.

Ignore what everyone else is doing. There is no such thing as safety in numbers when you are anchored. If your instincts tell you to move, but everyone else is staying, ignore the herd and put to sea. Many are convinced that it was the VHF radio, and the fact that almost all the boats were staying, that gave comfort to the masses even though the strategy of staying put was obviously dangerous.

Finally, a number of boats went on the beach with fouled props, which could have sailed their way offshore, had their crew known how.

Anchoring in unprotected roadsteads:

- ❏ Keep an eye on the weather.
- ❏ Be alert to unseasonable situations.
- ❏ Put to sea at the first sign of trouble.
- ❏ Avoid crowded areas.
- ❏ Try to avoid using a stern anchor.
- ❏ Make sure your ground tackle "system" is extra strong.
- ❏ Use oversized anchors—Twice "normal" is just about right.
- ❏ Make chain your primary rode.
- ❏ Have an easy way to slip the chain in a hurry.
- ❏ If necessary to cut the stern anchor rode, winch it in tight first so it springs away from the boat and cannot foul the prop.
- ❏ Know how to sail out of tight spots.

Help

Anchoring Strategies

Three basic anchors are shown below. The Bruce (our favorite) is on top. This heavy, cast anchor is not subject to damage. It works well on short scope and will work in soft mud if it is a bit oversized.

The Danforth is the middle anchor. These are great in soft bottoms or thin sand over coral. However, the flukes are easily damaged or jammed with debris.

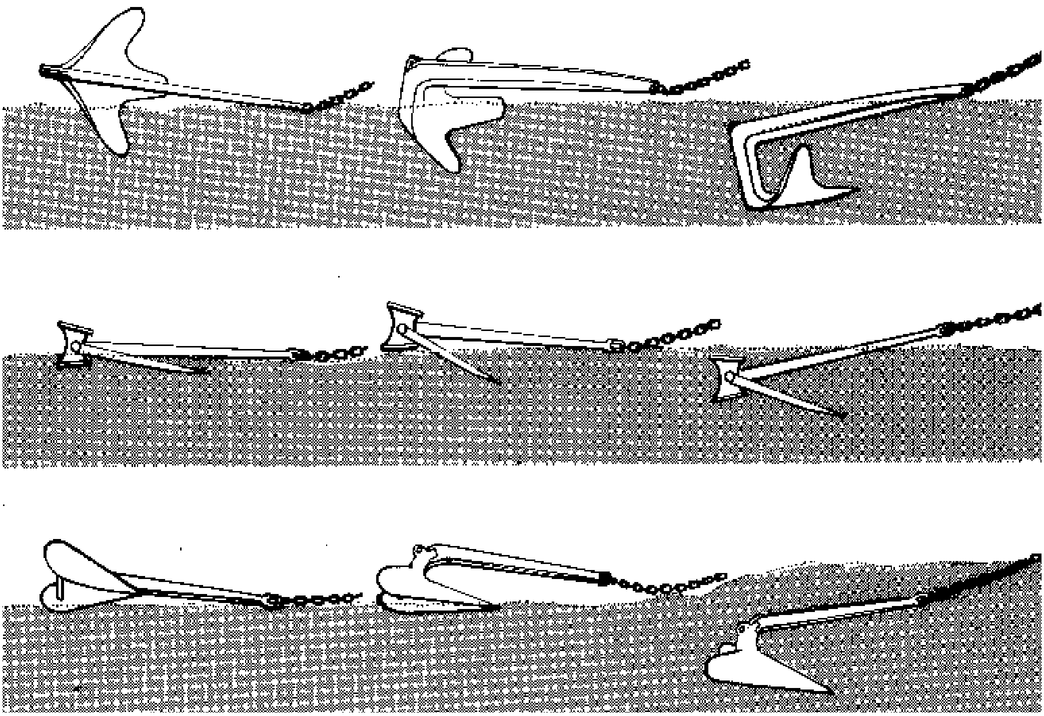
The CQR (plow type) is at the bottom. This is the primary anchor for many cruisers, and the one we used on Intermezzo before we learned about the Bruce.

In the context of anchoring defensively, four key factors control your approach to anchoring: bottom condition, swinging room, weather, and the protection afforded by your location. It is worth repeating that it is best to always assume the worst will occur, and consider your position in that light.

Anchor Types

What's on the bottom will dictate the amount of scope required, the best type of anchor to use, and your relative security. In soft mud, usually found where there is alluvial runoff, such as by the mouth of a river, a Danforth-type anchor works best (or an oversized plow or Bruce), because the fluke area provides plenty of holding in soft ground.

With harder bottoms, sand/or stiff mudplow and Bruce anchors hold well. The plows and Bruce-type anchors have less fluke area than the Danforthtypes and bury themselves into the bottom. Their advantage in harder bottoms is twofold. First, because they are deeply buried, when your position shifts, the anchor crabs around under the seabed to stay in line rather than drag or trip. Second, their flukes, although smaller, are heavier and are not as subject to bending or jamming as are the lighter, larger flukes of the lightweight Danforth-type hooks. Rock bottoms require a Herreshoff or yachtsman's anchor. In certain types of grass, you may need a yachtsman's or plow anchor to penetrate through to the sea bed.

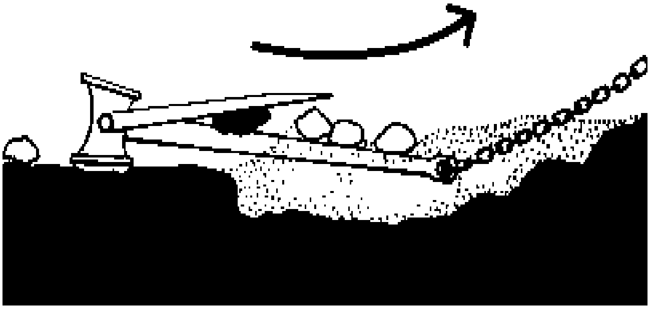


Help

Carry an Assortment of Anchors

It is obvious that *no single anchor will do it all*. The more experienced you become, the larger and more varied becomes the ground tackle inventory you feel you need to carry aboard.

Most conservative sailors carry either a burying or Danforth-type for everyday use, a second anchor of a different type as backup or for special conditions, and a third yachtsman's type as a "once-in-a-lifetime-hope-we-never-have-to-use-it" hook.



One of the problems with Danforth-type anchors is that they foul easily. Rocks or even beer cans or bottles will jam the flukes. They also trip when the direction of pull is changed and they have to re-set themselves.

The Bruce and CQR types, on the other hand, stay buried and crab around beneath the bottom surface.

Aboard *Intermezzo* we started out with a 60-pound (27-kilogram) CQR as the main anchor. A 35-pound (16-kilogram) Danforth Hi-Tensile hook was mounted under the bowsprit for use in soft conditions or when two hooks were deemed prudent. A Viking 22-pound (10-kilogram) aluminum anchor was carried aft.

When we were still tied up in southern California, that big CQR looked enormous, and we took some ribbing about its size. But a year and a half later when we had the chance in Suva, Fiji, to trade up to a 75-pounder (34-kilogram) we jumped at it.

Intermezzo II started out with a 110-pound (50-kilogram) Bruce as her primary anchor. She had two of the largest Vikings for stern use and backup. These had the holding power of 60-pound (27-kilogram) Danforths.

Given good holding ground, an amazingly small anchor will secure a large yacht. But you can always count on being stuck sometime in a tight harbor with minimum swinging room and a lousy bottom. It is under these conditions that you want to drop the biggest possible anchor.

On *Sundeer* we started cruising using a 110-pound (50-kilogram) Bruce as the primary hook, with two large Fortress aluminum hooks for backup. When Bruce came out with their 167-pound (80-kilogram) model, we switched, and the difference in short-scope situations was wonderful.

Beowulf went through the same sort of upgrading. We started out with the 167-pound (80-kilogram) Bruce. Then, in New Zealand, when we saw a 240-pound (110-kilogram) model we got it and again experienced a wonderful increase in short-scope capability.

Note: An in-depth discussion of ground tackle and handling systems can be found starting on page 39 in *Offshore Cruising Encyclopedia*.

Storm Hooks for Everyday Use

Our philosophy is to use the storm hook as our basic all-around anchor. When you consider that the holding power of the ground tackle system comes primarily from the weight and fluke area of your anchor, a big hook begins to make sense.

Help

Let's say you have a heavy bow roller and a windlass and you carry 300 feet (90 meters) of 5/16-inch (8-millimeter) high-tensile chain and four anchors. The total weight of these items may be 650 pounds (294 kilogram). If your main anchor is a 45-pounder (21-kilograms), it weighs less than 7-percent of the total. What happens if you upgrade to a 60-pounder (27-kilograms)? The total gain in ground tackle weight is minuscule, yet the ultimate holding power of the system in an adverse bottom has increased almost 50 percent. This is both a weight- and cost-effective means to security.

As far as anchors go, bigger is definitely better.

Bottom Conditions

How will you know in advance what to expect in bottom conditions? Charts and guidebooks usually give a general idea of holding characteristics. However, we've often found good holding where a cruising guide indicated foul ground.

Depending on its type, your depthfinder can be another source of data. The shade and width of its track indicate relative hardness: a thin, firm line on the chart or flasher means hard bottom; a thicker line signifies a soft bottom or perhaps grass.

An old-fashioned lead line with a little wax in its cone is another source of bottom information. Drop the line so the cone touches the bottom; the wax will pick up a sample for you to examine. If you are having trouble setting the hook, bringing the anchor back aboard will also give you an idea of the bottom conditions.

If it is clean, the sea bed is probably hard. Extremely soft mud leaves filmy traces on the flukes, and a heavily weeded bottom reveals itself

In the higher latitudes, where there are glaciated channels to explore, the cliffs are often perpdindicular. This vertical shape usually extends down into the water. Often it is so deep that the best way to anchor is with a line or series of lines ashore, along with a breast hook set off in deep water to hold you off if the wind shifts.

Help

Tropical anchorages often offer the biggest challenges. A thin layer of sand over a hard coral pan is typical. There is rarely enough soft material for the anchor to bury itself. Hence, oversized anchors become more important. In the above photo, taken at the bottom end of the Solomon Islands, the Marriotts and their steel ketch Makaretu are keeping a careful eye on the weather. There is a shallow reef fronting the island, and then a deep drop-off to the coral pan.

Low, sandy hills surround Sundeer anchored in Magdalena Bay, Mexico. You would expect the bottom to be of similar material, and it is. The holding is exceptionally good.

with the pieces of greenery caught on the hook or stuck in the shackle.

Often the topography of the shore and the type of rock or soil offers a clue as to what to expect.

Scope

Understanding the principle of scope is fairly easy. Anchors are designed to dig into the bottom, and the anchor flukes are manufactured in a special shape, to a specific angle, so that as they're pulled along the sea bed they tend to drive below the surface layer of bottom material.

Depending on bottom type and anchor design, at some point they'll stop their digging and begin to hold you from drifting backwards. If the pull on the rode is too steep, the stock of the anchor will be lifted off the bot-

Great Barrier Island, off Auckland, New Zealand. When we first dropped anchor here, we had this lovely bay to ourselves. About 1500, the locals started to arrive, and a few hours later boats were anchored all over the place—and, in particular, near our newly painted topsides. The Kiwis are the best sailors in the world, but anchoring...

There are hills on both sides of us and a shallow valley at the head of the anchorage. You can infer that the valley extends into the anchorage, and that the bottom will be of similar composition to the hills and valley above the water—in this case, soft mud.

tom and the flukes will not be able to start their digging-in process. In this case the anchor will just bounce along the bottom as you slip downwind.

How much scope you need depends upon the quality of the holding ground, the size of the anchor relative to the size of your boat, and the expected loads. With a heavy burying-type, good holding, and moderate conditions, you can be as tight as three-to-one—although you would normally use so little scope only if swinging space were limited.

The ideal scope is seven- or eight-to-one. But the nature of anchorage, your proximity to neighbors, or water depth may preclude you from using the ideal.

The characteristics of your anchor also affect how much rode you pay out. Some anchors require flatter scope than others. A Bruce and yachtsman can be used with very short scope.

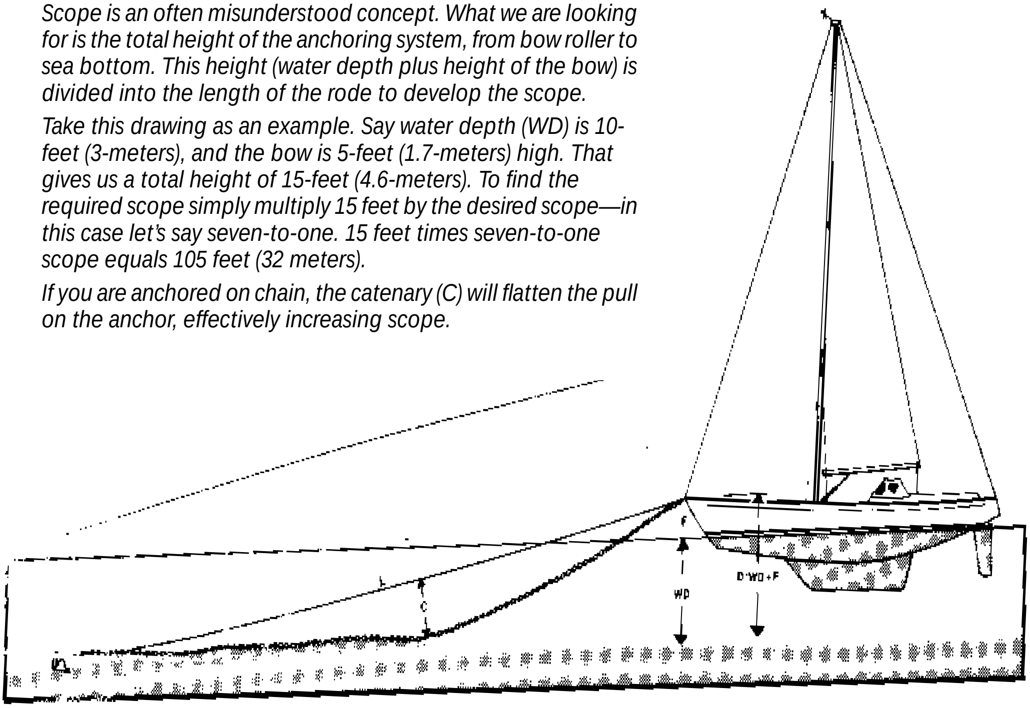
Bruce claims 50-percent holding at a scope of just three-to-one, and we have found that with our oversized anchors on both *Sundeer* and *Beowulf*, we can stand as much as 35 knots of wind in moderate bottoms with two-to-one scope.

Danforth types, on the other hand, require much flatter angles. Remember, with any anchor the flatter the angle, the more scope you have and the better the holding.

Scope is an often misunderstood concept. What we are looking for is the total height of the anchoring system, from bow roller to sea bottom. This height (water depth plus height of the bow) is divided into the length of the rode to develop the scope.

Take this drawing as an example. Say water depth (WD) is 10-feet (3-meters), and the bow is 5-feet (1.7-meters) high. That gives us a total height of 15-feet (4.6-meters). To find the required scope simply multiply 15 feet by the desired scope—in this case let's say seven-to-one. 15 feet times seven-to-one scope equals 105 feet (32 meters).

If you are anchored on chain, the catenary (C) will flatten the pull on the anchor, effectively increasing scope.

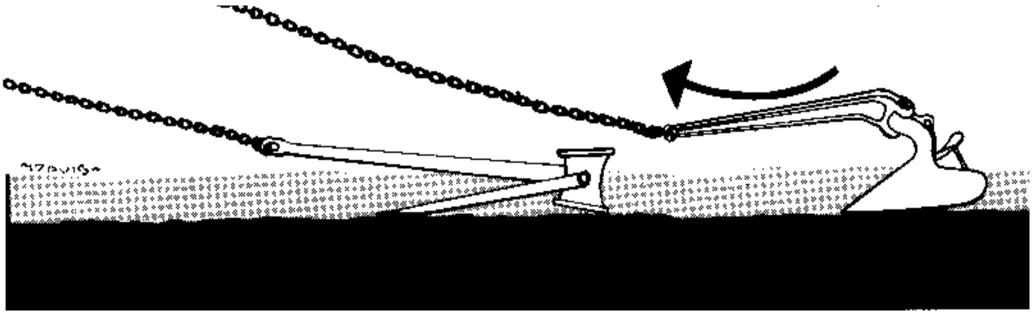


With some anchors, such as the Fortress type of lightweight hooks, it is best to set them at a flat angle, around seven-to-one, after which you can shorten up to five-to-one.

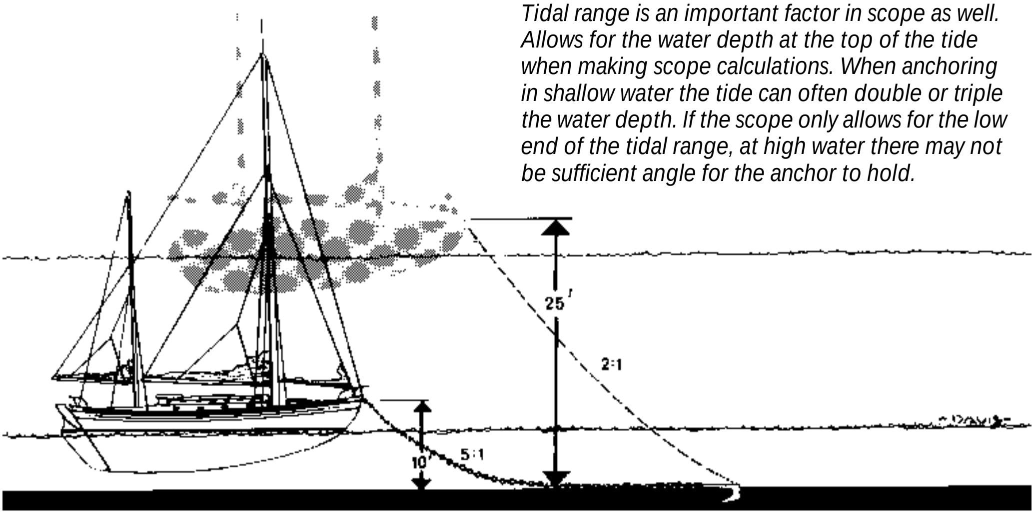
Once the anchor is dug in, the flatter the pull on the stock, the easier it is for the anchor to resist the load. As the angle of pull is lifted up from the bottom, the holding power decreases, slowly at first, and then disproportionally faster as scope is reduced.

Another factor on scope requirements, at least until the wind really starts to blow, is the type of anchor rode. If you anchor with chain you can get by with less scope then if nylon is being used. The heavier the chain, the less scope is required. This is because the chain sags from its own weight creating a catenary effect which lowers the angle of pull at the anchor stock. Once the loads on the boat build up and the chain is stretched tight, however, it will require the same scope ratios as nylon.

The flatter the pull the better the holding power (drawing below). Danforth-type anchors require more scope for a flatter pull than do anchors which bury deeper.



Help



Tidal range is an important factor in scope as well. Allows for the water depth at the top of the tide when making scope calculations. When anchoring in shallow water the tide can often double or triple the water depth. If the scope only allows for the low end of the tidal range, at high water there may not be sufficient angle for the anchor to hold.

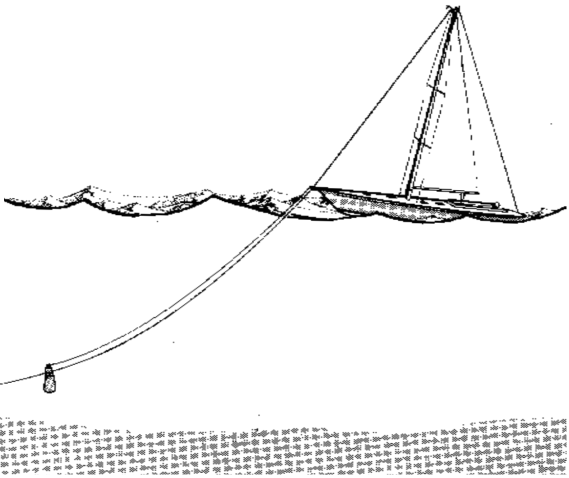
Reducing Scope Requirements

If you spend a lot of time in crowded anchorages there are ways to reduce your scope requirements. The most efficient, as we've already mentioned, is to increase anchor size. A bigger anchor gives more holding power, which in turn means you need less scope to keep you in place for a given load.

Switching from a rope rode to chain will have a similar effect, as will increasing chain size, although this is not as efficient in terms of total weight as just increasing anchor size.

You can also use a "deadman" weight. This is a block of lead or iron, typically one-third to one-half the weight of the anchor, which is slipped down the chain. This weight, acting in the middle of the catenary of chain, lowers the pull angle.

Another approach is to shackle two anchors in line with each other.



By letting a weight down the rode (the "deadman") you can improve the effective scope. The weight, suspended in midspan on the rode, increases the catenary (sag) of the rode, which improves the angle of pull on the anchor.

On the other hand, you could just take the same weight from the deadman and add it to the anchor, which would be just as effective and useful 100-percent of the time.

Help

Super-Soft Bottoms

Still, in certain situations no amount of scope will do, regardless of anchor type. We learned this one summer in Southern Florida.

An early hurricane threat had sent *Intermezzo II* and crew looking for cover. We had picked out a protected hurricane hole some time before, just in case, and in nice weather had found the secret to working our way through the shallow canal into the deeper, protected lagoon. But we had not checked the bottom.

After gaining the lagoon we found we had it entirely to ourselves. We set about cruising back and forth, noting depthfinder readings to check for potential trouble spots and to locate the shallowest place that would allow us good swinging room. We finally opted for a slight rise in the seabed, about 75 feet (23 meters) to the south of the geographic center of the lagoon.

We carefully maneuvered *Intermezzo II* into location and then had Linda drop the 110-pound (50-kilogram) Bruce anchor. We had room to let out all 280 feet (86 meters) of chain and still swing clear of obstructions along the lagoon's perimeter. Adding our 6 feet (1.8 meters) of bow height to the 10 feet (3 meters) of water, we had a scope of seventeen-to-one. The Bruce held up through half-throttle in reverse, but then it started to drag. Half-throttle developed the load of only 50 knots of wind, considerably less than what we expected.

We winched the Bruce back aboard and set one of the 32-pound (15 kilogram) Viking aluminum hooks we carried for soft bottoms. With only 25 feet (8 meters) of chain and 100 feet (30 meters) of line, the anchor stood up to full reverse, the equivalent of 70 knots of wind. We proceeded to reset the Bruce, as a backup, keeping a third Danforth-type anchor in reserve.

Access to Shallow Anchorages

There are many places in the world where you need to cross a river bar or shallow spot to get into the most protected anchorages. This is particularly true of mangrove swamps, which provide excellent protection in a hurricane. These barrier bars are usually found on rivers or estuaries. After the barrier is crossed the water usually becomes deep.

Your capability to push through these soft barriers is a function of how soft the mud is, the power your prop can deliver to the water and keel shape.

The more efficient your keel is in a beating context, the easier it will be to push through. This means that short, thin fins take a lot less power than full keels. Keels with bulbs or wings are usually hopeless in this regard.

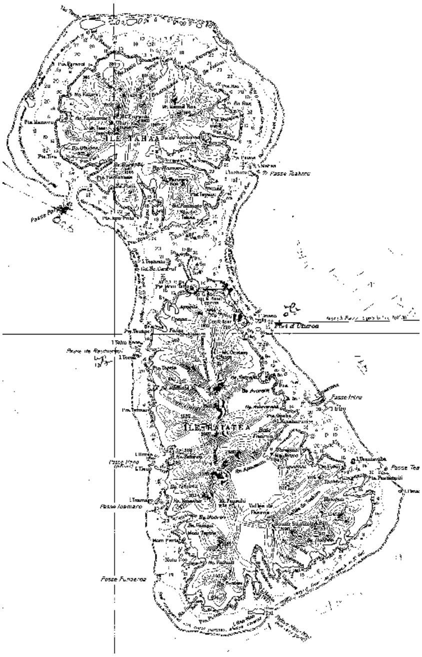
If you are uncertain, experiment on a rising tide. This way, if you get stuck, you know you will float off.

As long as you do not wear off too much of the bottom paint on the keel, there are no ill effects.

Securing the bitter end:

- ❑ The bitter end of nylon and chain rodes should be secured so that if you are distracted and don't realize you are at the end, you don't lose your anchoring system (this has happened to us!).
- ❑ The attachment point should be strong enough so that it will take the shock load of the fast-running chain without failing.
- ❑ Use a bowline at the boat end. Since our experience losing our chain in Mexico (which we eventually got back) we have always *sewn* a seizing over the knot end.
- ❑ With chain, allow enough of an attachment line to make it easily accessible should the need arise to cut it in an emergency.

Help



Raiatea

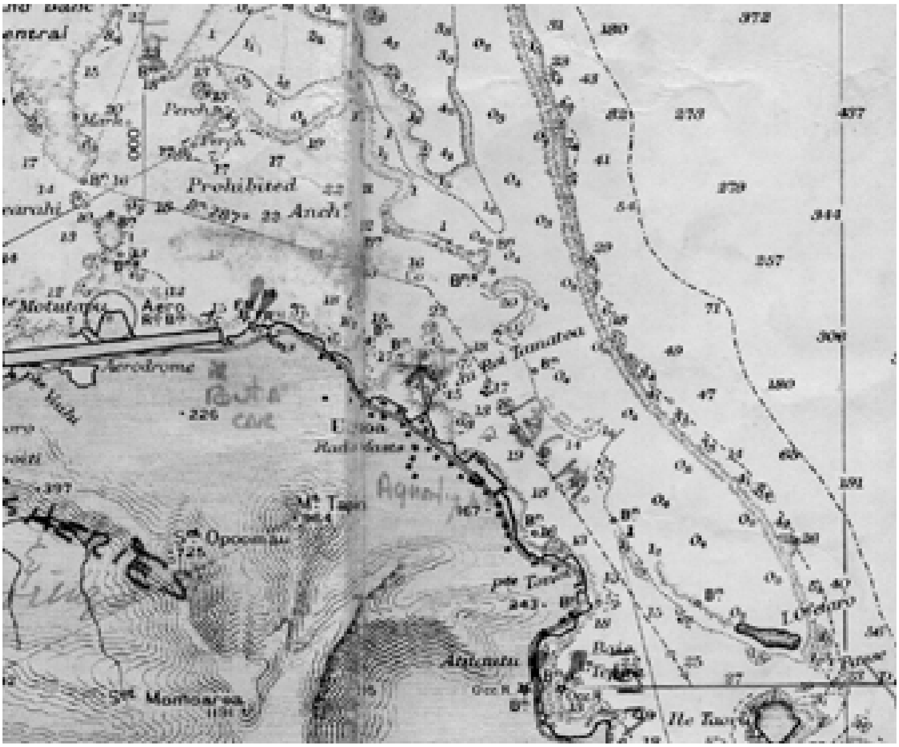
Our worst experience with dragging the hook before it set took place on the beautiful island of Raiatea in the French Society Islands.

A short sail from Tahuata had brought us to the entrance pass for Raiatea by mid-morning. With the sunlight behind us, we had no problems entering the pass and then running down the lagoon inside the reef. Turning the corner into the anchorage, we found many old friends waiting. Elyse and Sarah would have playmates, while Linda and I could swap sea and land stories with the assembled cruisers.

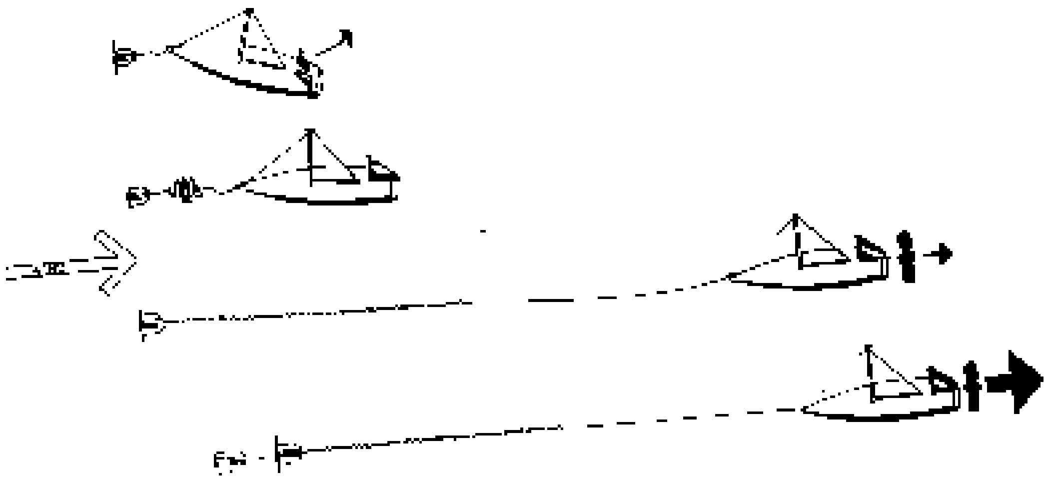
A famous old bakery along the road into town reputedly offered the best coconut bread in the South Pacific, and we were eager to confirm its reputation.

Unfortunately the quay was already crowded so we were forced to anchor out. We circled around and around, looking for a shallow spot to drop the hook, without luck. We would have to let go in 15 fathoms.

Raiatea and its sister island, Tahaa are magical places where cruising dreams come true. The only problem is that the anchorages for the main town of Utoroa are a little deep! Note that the depths shown are in fathoms.



Help



That meant we had to use all 480 feet (147 meters) of chain to get any sort of reasonable scope.

The lagoon bottom was uniform in depth with the occasional coralhead coming within a few feet of the surface. Surrounded on all sides by steep-to reef, this lagoon had a well-deserved reputation for the worst holding in the Society Islands. A very hard coral bottom overlaid by a thin layer of sand created the problem. There simply was not enough soft bottom material to allow our big plow anchor to dig in.

If we used a Danforth, we risked jamming the flukes with coral or having the anchor trip out when the boat swung with the tide.

Our only answer was to drop the CQR and drag it until it found a sand pocket big enough to bury itself.

I circled two times around the lagoon, watching the depthfinder just to double-check. Then, positioning *Intermezzo's* bow in the middle of the anchorage, I signaled to Linda to let the hook go. With so much water depth she had to keep the clutch partially on to reduce the chain's exit speed.

Once the anchor was on the bottom, I carefully backed *Intermezzo*, using as little power as possible, until we had 400 feet (130 meters) of chain veered.

Because the bottom was so strewn with coralheads, I wanted the chain laid straight. Using a combination of riding sail and windage to drift us backwards in a straight path was preferable to reversing in a circle!

With all chain finally veered, Linda set the brake on the windlass and then put in the gypsy lock. She came aft to take over the controls while I went forward to interpret the signals coming up the chain. I signed to Linda to put the engine in reverse, slowly. I wanted to apply minimum pressure to the anchor until it started to dig in. When I felt it beginning to hold, we would gradually kick up the throttle until we were in full reverse.

Backing down in a straight line on a foul bottom goes a long way towards reducing the chances of fouling the rode or anchor.

On split-rigged boats you can use the mizzen as a riding sail to hold your bow into the wind as you drift back. You can also push the sail to one side or the other to influence the direction of drift.

If the boat doesn't power straight in reverse (few do) it often is best to allow the wind to take you back, using the engine to dig in the anchor after the rode has been laid.

Help

Anchor shackle tips:

- ❏ Shackles should be as strong as the chain or rode (which usually means buying high-strength steel shackles).
- ❏ Stainless shackles are rarely as strong as the chain to which they are attached.
- ❏ With high-tensile chain, you may need to use an ungalvanized shackle as it is sometime difficult to find high-yield shackles in other than plain finish.
- ❏ Shackles should have their clevis pins secured with stranded (not solid) seizing wire. Use at least three wraps of wire.

Opposite: Honiara, the capital of the Solomon Islands on the island of Guadalcanal is an open roadstead, with moderate to poor holding off a steep-to beach.

Boats have been lost here a number of times in severe squalls or larger systems. In this photo the double-ender to the right is hanging on to two anchors. The Bermuda 40 on the left is using three.

Our preference would be to lift anchor and get out to sea.

This all sounds fine in theory, but in practice, Polynesian style, something was lacking. The CQR simply refused to dig in. It would bump and bounce along the bottom and then stop abruptly as it snagged a rock or coralhead. Occasionally I thought I felt it biting, but when Linda applied more reverses it would start to slide again. Finally we had reached a point where our stern was just off the reef.

After winching aboard all 480 feet (147 meters) of chain (and giving thanks for our electric windlass), we repositioned ourselves well upwind of the middle of the lagoon. I hoped this time to hook in by the time we reached the middle.

In the end, we went through the procedure four times before getting a reasonable bite in a position that allowed us room both to drag and to swing 360 degrees.

Two decades later, anchoring in the same place with the same bottom conditions, the results were different. Using *Beowulf*'s huge (240-pound/110-kilogram) Bruce and just two-to-one scope we had no problems getting a good bite. The difference was the ability of the Bruce to dig through the sand and catch on the hard limestone pan beneath.

Determining Rode Length

It's important to be able to tell accurately just how much chain or nylon you've let out. This means marking your anchor rode at predetermined intervals. My preference is to put leather or vinyl "fingers" every 5 fathoms for the initial 20 fathoms of rode, and every 10 fathoms thereafter. I like these to be about 3 inches (75 millimeters) long, so they can be easily seen at night. Some people number them to indicate the length. However, I've found that using multiple "fingers" (3 fingers equals 30 fathoms) is easier.

Another approach which also works well is to use heavy-duty nylon wire ties as markers.

The last 5 fathoms should be continuously marked in unmistakable fashion to remind you that the end of the rode is near.

Twin Anchors

When the weather looks threatening you may want to increase the holding power of your anchoring system. The simplest method of doing so is with another hook.

Once the second anchor and rode are ready to go, power slowly to windward, wide of your first hook and keeping watch on the first rode so it doesn't foul your keel or prop.

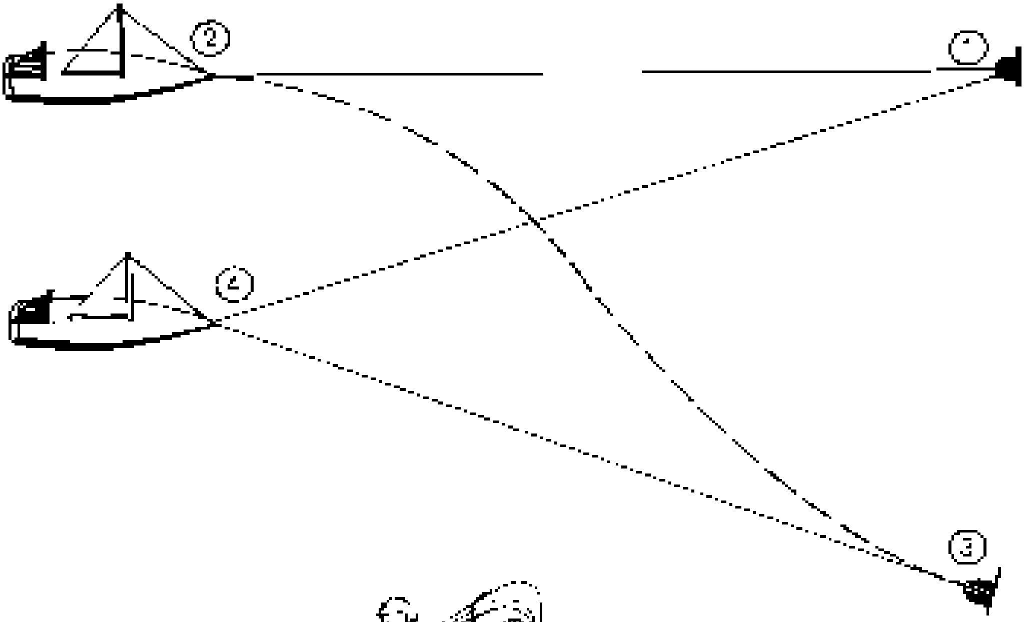
If you are setting a nylon rode and already have the first anchor on chain, take the load on the nylon. It will act as a shock absorber and take most of the strain, leaving the chain rode as the backup system.

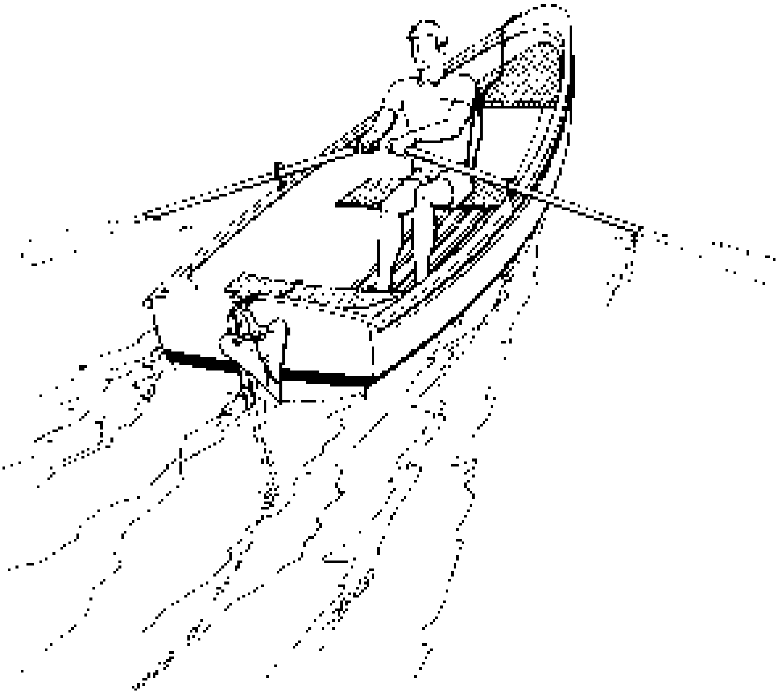
In this case, adjust the scope on the nylon so that in wind puffs, about halfway through its stretch, the chain rode begins to lift and tighten.

Help

Vicky Carkhuff

Help





Setting a second anchor is quite simple if you have sea room in which to maneuver. You should not be tied to shore, nor should you be using a stern anchor, as is the case with the boats in the previous page.

The easy approach is to power to where you want the second hook set, and then ease it off the bow, taking care not to allow the rode to get under the boat (where it can foul the keel, rudder or prop).

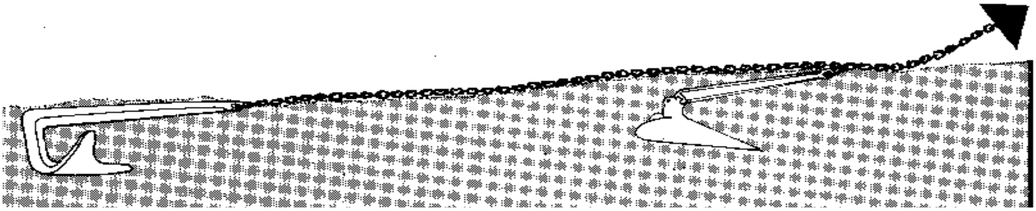
If you're already fixed in place, the alternative approach is to use the dinghy.

If you are rowing, tie the anchor over the stern with a slip knot, so it is easily released when you get to where you need to be. If the distance is very far upwind, it is often easier on the rower if the rode is flaked into the bottom of the dinghy where it pays out from the dink, rather than the other way around.

If an outboard is used, the anchor is usually best tied off the bow, clear of the outboard prop; then the dink should be backed away from the mother ship.

When dropping the anchor from the dink be sure to go far enough past the spot you want so the anchor has room to drift back a bit.

Help



Two Anchors in Line

There are times when it makes sense to use two anchors on a single rode. Assuming the rode itself is strong enough, and chain is not subject to chafe, the two anchors will typically hold on one rode as well as or better than if on separate rodes. And there is less risk of fouling the anchor rodes together.

Of course this approach does not work after one anchor is already set and it looks like another may be required. So, this technique needs to be adopted well in advance of need. It is often used when the boat is to be left unattended for a period of time.

Bow and Stern Hooks

We avoid using bow and stern hooks as much as possible. The loads increase with beam winds since the boat cannot weathercock and there is always the risk of fouling the stern rode in the prop (yours, or someone else's).

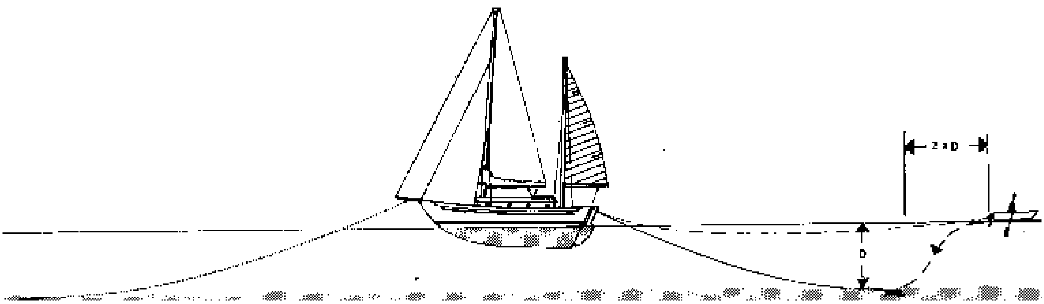
However, it is sometimes necessary to anchor bow and stern to keep aligned with swell or to avoid hitting neighboring boats in a crowded anchorage. The stern hook is frequently set from the dink, after shutting the engine down.

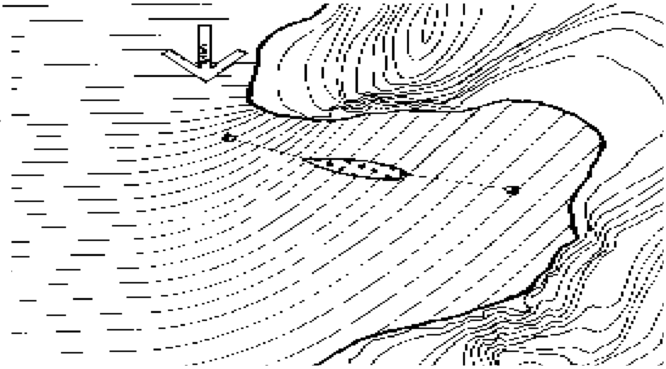
Handling a good-sized anchor from a dinghy requires some care. We find it best to hang the anchor over the stern with a trip line, piling chain and some rode on the stern seat. I then row towards the desired spot while Linda pays out line from the big boat.

It is necessary to row past the actual spot you want to drop the hook. Once you quit rowing the weight of the rode will pull you back towards the boat, until you drop the anchor. The anchor will tend to glide towards the boat as it sinks. As a rule of thumb we usually row out beyond the actual spot we want the anchor to set twice the water depth (see illustration below).

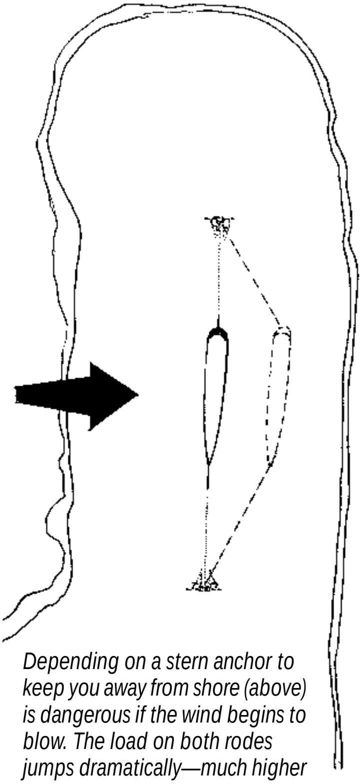
Setting the stern hook from the dink (or a second bow anchor) requires that the anchor be carried roughly twice the water depth beyond the point at which at which it is expected to come to rest. Additional allowance must be made for any distance it is expected to drag before setting.

With enough rode forward, it is much simpler to allow the boat to drift back and drop the stern hook directly overboard.





Open roadsteads (right drawing) often have a swell which wraps around the headland, turns 90-degrees or so, and then starts the boats rolling as it hits them at right angles. One answer is a stern hook, to keep the boat aligned into the prevailing chop. This works as long as the wind doesn't blow too hard on the beam. When the wind is on the beam anchor loads increase geometrically!



Depending on a stern anchor to keep you away from shore (above) is dangerous if the wind begins to blow. The load on both rodes jumps dramatically—much higher than on a single anchor with the boat head-to-wind. Getting out of a tight spot like the one shown here can be tricky. Have an exit plan in mind before you commit to the second anchor.

With this system of setting the stern anchor you may have to use the dinghy to pick it up, too. If weather forces a rapid departure, there may not be time to retrieve it. When possible, we prefer instead to set the stern hook by backing down on the main anchor, laying out extra chain up forward in the process, setting the stern hook, and then winching the boat back between the two anchors.

This method makes it possible to pick up the stern hook by simply reversing the procedure and there's no need to resort to the dink.

Wind on the Beam

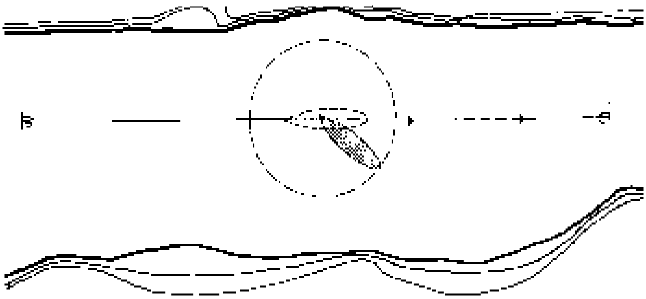
Remember that if the wind shifts to beam-on, the load on the two anchors will be much greater than if you are anchored from the bow only.

This means the stern anchor and rode must be able to take as much strain as the main anchor and that the leads and attachment points aboard must be heavily reinforced.

Consider ahead of time what happens if you have to exit with a beam wind. Will you will have time to recover the bow anchor before you blow off to leeward into another vessel or underwater obstruction?

Bahamian Moor

Should you find yourself in a spot with strong reversing currents, you may need to set two bow anchors, one uptide and another downtide, with the bow of the boat bridled between them. As shown above, the first step is to drop the hook and then drift back and establish a central point. The second anchor is then set off the bow (by drifting back or using the dink). The trick is in



keeping the rodes from wrapping around each other as the current reverses—something not always possible.

Current against Wind

When currents are running at an angle to the wind, boats often behave in a strange fashion. You could end up with the chain veered aft along the hull, or at right angles. This depends on current and wind strength, and their relative directions. It is further influenced by the underwater and abovedecks drag. Sometimes two boats close together will lie at right angles to each other in the same conditions. When the boat is lying at angles approaching 90-degrees to the wind, the side loads on the bow roller system become very high, with a tendency for the rode to jump out of the confines of the bow roller assembly.

There are many things that can be tried to get the boat to lie more comfortably. Sometimes just cranking the rudder hard over in one direction or the other will do the trick. You can also stream a small drogue or parachute off the stern to get the boat more aligned.

When picking the right spot to drop the hook, allow for abnormal swinging of the various neighboring boats.

When current-bound:

- ❑ Make sure the rode is strongly captured in bow roller so it cannot jump over the side.
- ❑ Try adjusting the rudder to one side or the other to make the boat lie more comfortably.
- ❑ Use a small drogue off the stern to align better with current flow.
- ❑ Allow extra swinging room.
- ❑ Tie dinghies alongside rather than allowing them to trail aft.
- ❑ Anchor in shallower water, out of channels, where current is apt to be weaker.

Beowulf current-bound against the wind (left photo) at Nantucket Island off the East Coast of the US. The chain is running aft and against the bowsprit bobstay. In this case, adjusting the rudder hard over to port helped move the chain more ahead.

Below, a neighbor bouncing around a bit in the same anchorage. The photos were taken about 15 minutes apart, as the tide was changing.

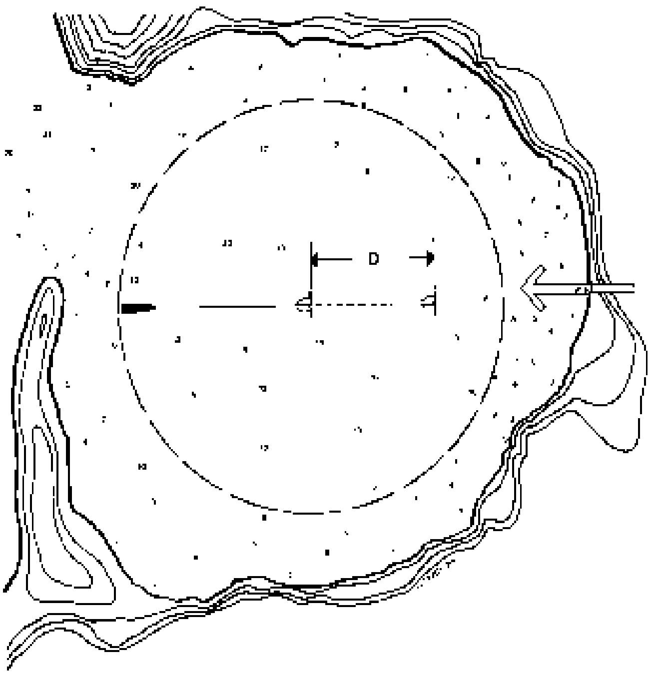
Help

Picking the Right Spot

Picking the right spot in which to drop the hook is more art than science. With so many variables to be considered, a cookbook formula is not possible.

The key is to be patient, take your time, look around, and think things over.

The approach we have developed over the years when we come into a new anchorage is to cruise back and forth for awhile under sail or power. We like to define the bottom contour with the depthsounder, and see how the different boats in the anchorage are lying. We've found over and over again that the more time we spend checking things out, the more successful the anchoring drill.



Unless the anchor and bottom are ideally matched to each other, the anchor will drag a bit ("D" in the drawing above) on the bottom before it digs in. When deciding on where to initially drop the hook, allow for this fact.

Note that the more scope used, the quicker the anchor will dig in. Also, setting it gently under power, then gradually increasing rpms as the anchor digs, in will reduce the distance of the initial dragging.

Room to Set and Swing

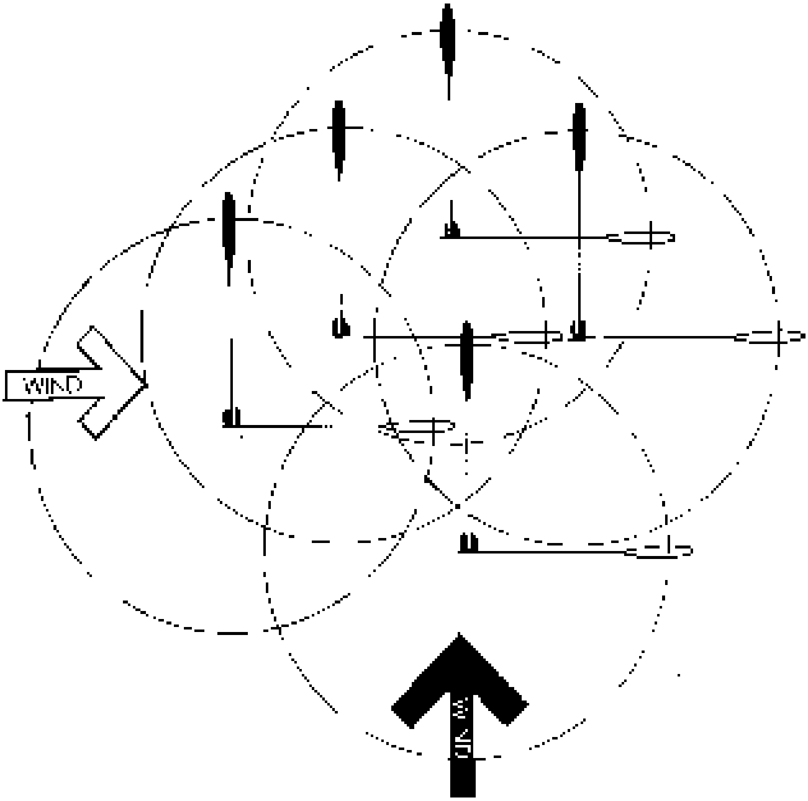
Ideally, you will have room to swing 360-degrees if the wind shifts. In addition, consider the distance the anchor may drag before it sets.

If you have a soft ooze on top and hard mud underneath, it may take four to five times the water depth with seven-to-one scope before the hook really digs in, depending on your anchor type.

Burying anchors take longer to get a good bite, while a Danforth will dig in immediately. As we related in the Raiatea story (page 384), in tropical waters you'll sometimes drag the hook for a long distance before it will find a sandy spot to dig in, unless you find a clear spot from the surface first.

Even if we plan to anchor on short scope eventually, we initially set our hooks on longer scope. The flat angle makes it easier for the anchor flukes to dig in.

Help



When looking at where to drop the hook, shifts in the wind and current need to be factored in. Add in the difference in swinging between boats on rope and those on chain, between power and sail, and between different types of sailboats, and it is enough to give a person a headache.

With unpainted aluminum topsides like ours this is not as big an issue!

Below, what happens when the wind shifts—in this case at Falmouth Harbor, Antigua, in the West Indies. This mess came about as a large squall passed through, temporarily shutting off the trades and reversing the normal wind pattern. With the aid of some shouting and several outboard powered inflatables the anchorage was soon orderly.

Other Vessels

Of course, picking the best spot to anchor depends upon how many and what type of neighbors you have. Boats of varying designs behave quite differently at anchor, and you need to allow room for them to swing, as well as considering your own movements.

Single-stickers, especially sloops, sheer about more at anchor than do cutters and ketches.

Those lying to rope move a great deal more than those held with chain. Boats on light chain move more than ones on heavy chain. The amount of scope directly affects a boat's swinging radius.

It sometimes makes sense to ask your potential neighbors what and how much they have out and where their anchors are set.

Help

Anchorage check list:

- ❑ Is it secure if the wind shifts?
- ❑ How about if it starts to blow hard?
- ❑ Is there a diurnal wind shift to be considered?
- ❑ What about tidal currents?
- ❑ Can you swing without getting caught up with other boats?
- ❑ If you drag, will you go aground? What is the risk to the vessel from the bottom?
- ❑ Will the fetch allow seas to build up if the wind starts to blow?
- ❑ Can you exit in poor light or at night?
- ❑ Are you far enough offshore to be away from shore-based bugs?
- ❑ Do you have a good location for staying cool?
- ❑ Will it be too windy? Is there a better location where local topography will block the wind?
- ❑ Do you expect commercial traffic?

Traffic

In certain anchorages you need to give thought to local traffic. This may be the coming and going of the fishing fleet, or the weekly arrival of a large ferry.

Fetch

Fetch is always a consideration. The closer you are to a weather shore, the less distance there is for seas to build if the wind shifts.

But if the anchorage is in a large bay or lagoon, can you change sides in the anchorage to reduce fetch in a wind shift? Can this be done at night?

Open Anchorages

When anchored in an open anchorage you are subject to changes in sea state. This is generally merely a comfort issue, unless the sea really begins to make up.

As long as the seas are bow- or stern-on you are okay. But if they start to hit on the beam it will get uncomfortable very quickly.

We've already mentioned the use of a stern anchor to hold you into the swell. Sometimes a riding sail, angled to one side, can push your stern around 15- to 20-degrees—just enough to settle things down.

Or, you can use flopper-stoppers. (See the "Roll Control" section starting on page 420).

Bugs

Where insects are a problem it usually pays to anchor further offshore. Unless there is a substantial offshore breeze, an eighth to a quarter of a mile is usually plenty to keep you free of sand fleas and flies.

Mosquitoes, with their high-aspect-ratio wings, seem to have more range, requiring additional space to leeward.

Keeping Cool

Many tropical anchorages have surrounding mountains which tend to create offshore winds at night. Sometimes these winds descend from aloft and are pleasantly cool.

There will usually be a favored side to the anchorage for these evening winds. If there are canyons or valleys, the best breeze will be found in line with the openings.

Generator and Engine Exhaust

If there are neighbors, check out their generating situation. If someone has a genset, it is best to anchor on the side away from the exhaust.

If the main engine is used for fridge and batteries, don't anchor downwind as you'll be smelling and listening to the charge cycle every day.

Etiquette

Nothing is more annoying than to be sitting in a pleasant anchorage with good swinging room and have a newcomer anchor right on top of you. Don't be guilty of this yourself. Make sure when you fetch up that there's plenty of room between yourself and the others in the anchorage.

If you are the last to anchor and you begin to drag, or a wind shift puts you too close to another vessel, it is your responsibility to adjust your rode or move if required.

Privacy

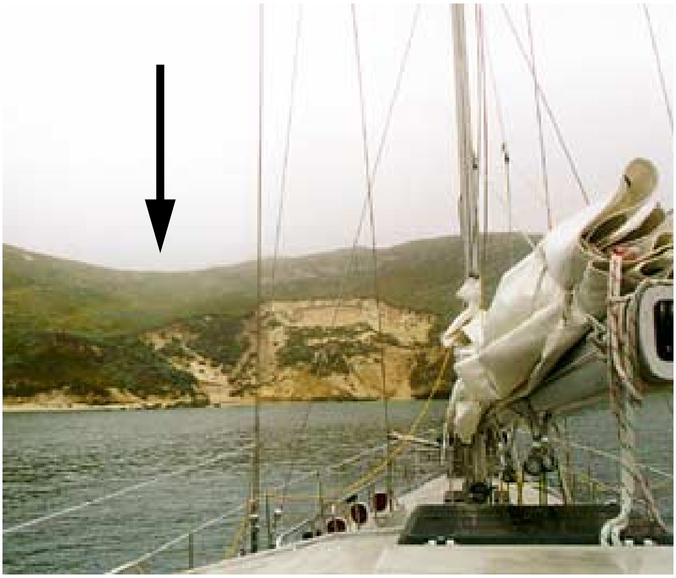
In some cruising areas in the world it is difficult to find a quiet anchorage. There are so many boats that everyone tends to anchor on top of everyone else.

Topside bangs and anchor fouls are often considered inevitable.

We have faced this problem in the Caribbean with charter boats, at Catalina Island off Southern California, and in New Zealand during Christmas.

The only solution we've found is to anchor in an unpopular corner, hopefully one not listed in the local guidebook.

If the water is deep and you have lots of chain, simply taking yourself into deep water will separate you from those with a more casual approach to ground tackle.



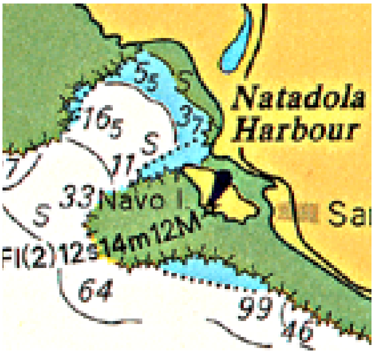
A lovely summer day at San Miguel, in the Channel Islands off the Southern California coast. The weather is overcast and windy, typical for the summer here.

These two photos are taken anchored about 300 feet (90 meters) apart. In the upper photo, we've dropped the hook without thinking about the wind gusts pouring through that small depression in the hill (black arrow).

Below, we've moved about 300 feet (90 meters) to port, with the hills almost shear ahead of us. The difference in wind is dramatic. From 30-knot gusts we are down to a steady 12 to 15 knots—far more pleasant, and easier on the ground tackle.

Help

Natadola Harbor on the southwest corner of Viti Levu in Fiji is a favorite stop for cruisers.



The south coast of Viti Levu, Fiji, has a number of potentially dangerous anchorages. One of the worst is Natadola, a favorite spot for yachts, with a resort hotel and village along the shore. This faces southwest—straight at Antarctica—and when the Southern Ocean kicks up its heels, surf can build rapidly here. Note both the wedge-shaped harbor and gradual shoaling (depths in meters). On at least two occasions yachts have been thrown ashore by the surf here—one incident happened a week after our visit. The trick is to anchor in deep water (at least16 meters), outside of the surf line.

Bottom Contour

Finally, we need to discuss the issue of bottom contour and harbor shape. Certain combinations of factors tend to generate breaking waves out of relatively modest swells. The swells sometimes arrive unannounced, from a storm thousands of miles away, and within minutes the areas close to shore are transformed from a calm anchorage into one which is filled with breakers. We want to stress that these situations can arise without warning.

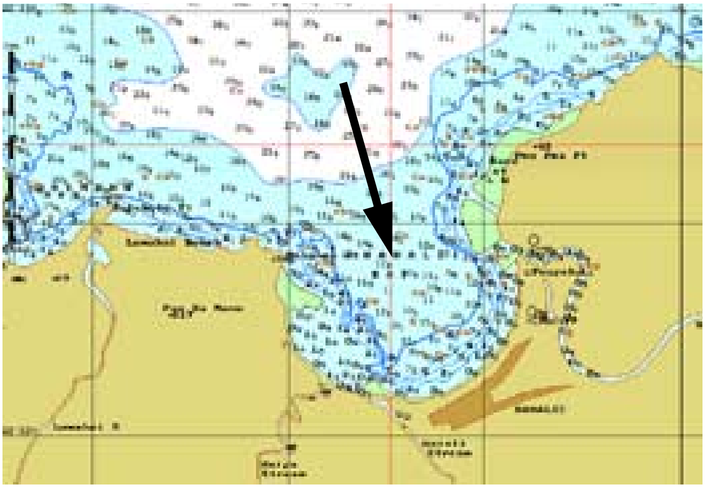
These risks exist in some of the nicest destinations in the world. The defensive anchoring solution is quite simple: Stay in the deeper water.

What characteristics do you look for? The first is exposure to the open ocean. It is here that unexpected swells from distant storms, will cause problems (if there is risk from nearby weather you will be more apt to expect it). Examples of this would be north- and east-facing anchorages in the Caribbean, where Atlantic storms on occasion send huge swells.

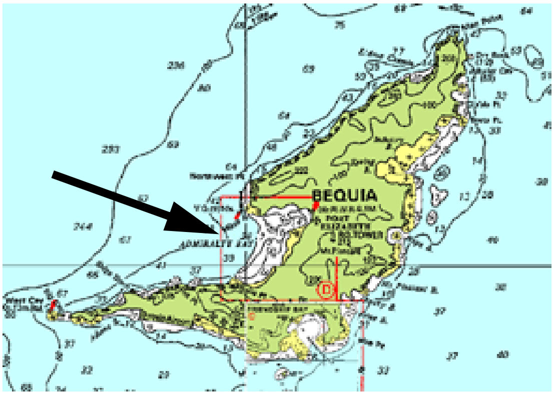
Another example would be the north-facing anchorages in the Hawaiian Islands, or the east-facing locations in Fiji.

Help

Here are a couple of wonderful anchorages that would be dangerous in the wrong kind of weather. Top right is Hanalei Bay on the north shore of Kauai, in the Hawaiian Islands. If the trades are quiet, the anchorage is reasonably comfortable, so long as you have good roll-control gear aboard. But if any weather starts to kick up to the north, be prepared to exit fast, as the entire inner part of the bay becomes a wonderful surfing spot. In fact, even in settled weather it is safest to anchor in deep water, outside the winter surf line.

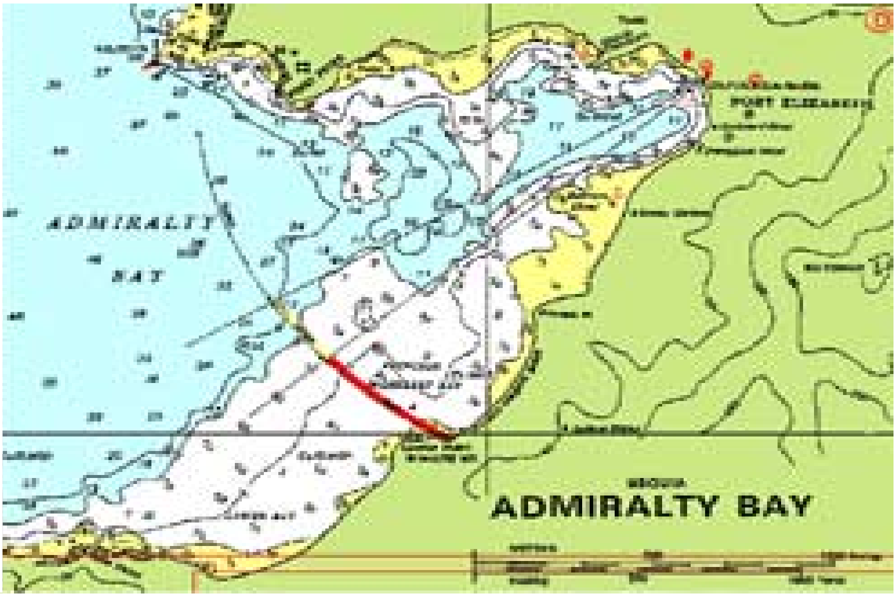


Transas Chart



Bequia in the Caribbean is probably our favorite spot in that part of the world. The locals are friendly, the boat-watching is great, and for the most part the anchorage is protected—at least from the prevailing trades.

But despite the serene setting, wind does come in from the westerly quadrant. Sometimes it is from a tropical disturbance, at others just a local, but intense squall system. When this occurs, your back is suddenly against a dangerous lee shore. Combine this with shoal water at the head of the bay, and add a great crowd of boats, and you find the potential for another Cabo-type disaster. The key is to be prepared to leave in case the weather turns.



Maptech Charts

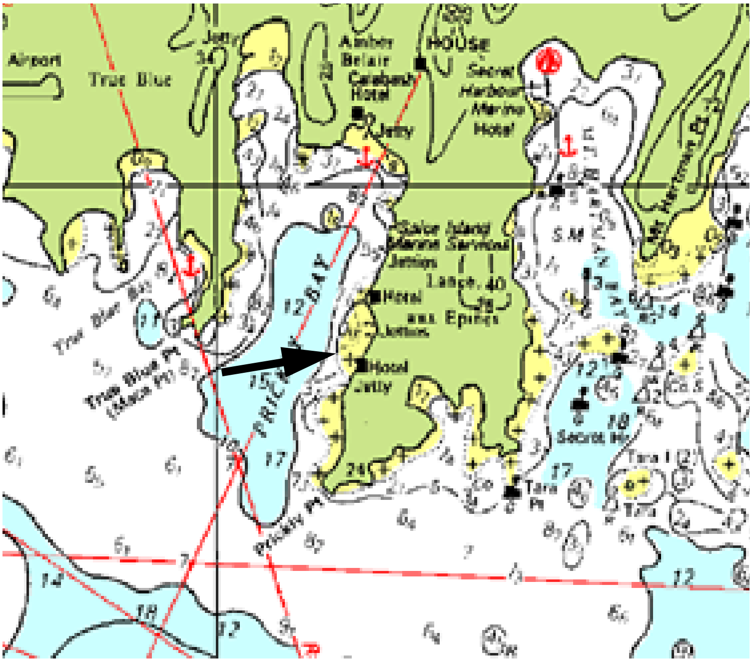
Help

Getting Out of the Swell

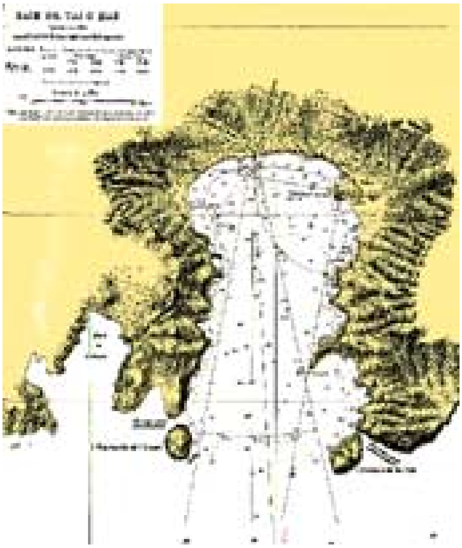
In open roadsteads it is often possible to find a corner that is more protected from the swell which is wrapping around a headland than other places in the anchorage. Usually, the closer you can tuck in under the headland the better. Often there will be a rock or bit of reef which you can tuck in behind. One of the keys to finding the right spot is to take your time, work around the anchorage for awhile, and observe from some distance off the deck.

How about the bottom end of Grenada, the fabled spice island of the Caribbean? Prickly Bay and Mount Hartman Bay are both popular spots with charter fleets and longer-term cruisers. Both are open to the south and in strong southeast trades can become dangerous lee shores. With heavy anchoring gear and the ability to sail or power offshore if the situation becomes dangerous, you can still enjoy this sort of anchorage. Just stay alert to changes in the weather and be prepared to exit if things deteriorate.

To get out of a typical southeast tradewind swell it is often best to anchor close to the beach, about halfway into the bay (arrow).



Maptech Chart

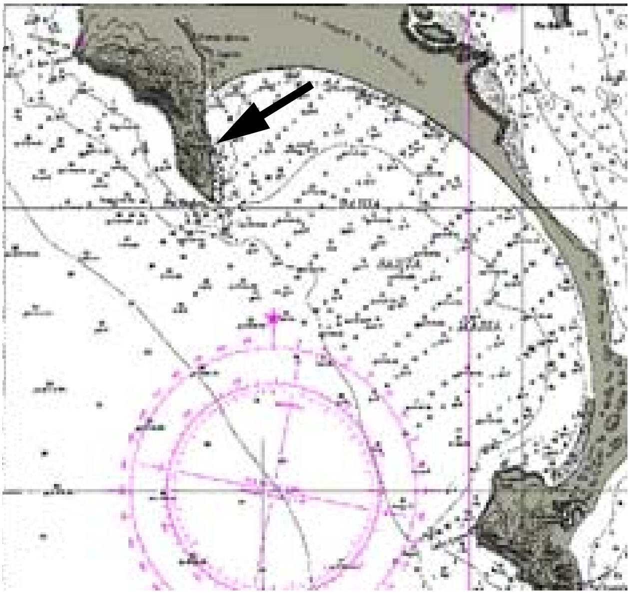


Maptech Chart

To the left is Taiohae Bay on Nuku Hiva in the Marquesas Islands (the eastern part of French Polynesia). This is a wonderfully protected anchorage in northeast tradewinds, but when the wind is blowing from the southeast, Taiohae can be quite rolly.

The bottom offers indifferent holding—it is common to see boats with light gear dragging even in moderate conditions. When the weather turns unstable, extreme shifts in wind direction and velocity occur as squalls come roaring down from the precipitous mountains surrounding the bay. If you have oversized ground tackle, and are anchored on chain, you can ride out most of this weather, provided you are far enough off the beach to avoid the surf line. But you need the "oversized" ground tackle.

And getting out of the swell? That varies with the wave period and how much south there is in the southeast trades. At times the northwest corner is favored, and at others the northeast works best. We've sometimes found it necessary to move every couple of days.



Bahia Maria, just north of the entrance to Magdalena Bay on the Pacific side of the Baja California peninsula.

The prevailing winds are from the west to northwest. You would think in a northwest wind the anchorage would be calm, but the swell will wrap all the way around and into the bay. The best spot for escaping the swell is at the outer edge of the indentation (arrow).

Because the anchorage is open to the south it is at risk in frontal weather when the winds usually start in the southeast to southwest. Be prepared to exit quickly.

Stock Newport

Check out the roller-furling jib on this yacht stranded in the Bahamas. Unanticipated unfurling of roller-furled jibs is a common cause of stranding. A frontal passage or strong squalls bring an increase in wind. The edge of the sail begins to chatter, and if the sail isn't tightly furled, all of a sudden there's a substantial chunk of sail luffing in the rising wind. This tends to pull out more sail. The windage is enormous, and before you know it, the boat is on the beach. The antidote (as we've previously discussed) is to make sure the jib is tightly furled (by keeping a strain on the sheet while rolling the sail), and to lock off the tack so it cannot unroll accidentally.

Setting the Hook Under Power

The only way you will know if your anchor has a good bite is to set it with the engine in reverse.

If the wind is blowing, you can use it to blow the boat downwind, dragging the rode on the bottom, until it fetches up on the anchor.

Setting the anchor:

- ❏ Apply power slowly until rode is stretched tight.
- ❏ Bring up rpms gradually, keeping a foot on the rode to see if the anchor is slipping along the bottom.
- ❏ Watch for the rode to go tight, and then suddenly loosen. This indicates the anchor is moving.
- ❏ Use visual bearings on shore or on other boats to confirm position.
- ❏ Check water depth to make sure it is staying the same.

The rode should be paid out *slowly* as you drift or power downwind. After a scope of five-to-one or so is reached, start to apply a modest amount of tension to the rode. This will begin the process of digging in.

If your boat tends to circle under power in reverse, drop the hook with a small amount of sternway and then pile chain just behind the anchor. Allow the wind to carry you straight back. At the desired scope, snug up the rode and allow the anchor to dig in under slow reverse.

How Much Engine?

Then when you feel a bite, apply more power to set the anchor securely. Start slowly, wait 30 seconds or so, then pick up the rpms, wait for a bit, then repeat the process.

How much power is enough? That depends on the boat and propeller. A sailboat with a folding prop requires full reverse rpm. A fixed prop will do a good job at 70-percent throttle, and a reversing feathering prop will give excellent thrust at 50-percent power.

Aboard *Intermezzo II*, which had a full reversing prop and an efficient engine, we used full throttle just to be sure. When the bottom was good, Linda would hold power on for 15 or 20 seconds. If we were not sure of the bottom type, we maintained full throttle for a minute or longer. Both *Sundeer* and *Beowulf* have powerful engine/prop combinations and enormous anchors. These elements combined let us know that we have a really good bite.

Feeling the Rode

Bottom characteristics will be telegraphed up the anchor rode while you are setting the hook; experience teaches you the code. Placing your hand/or foot on the chain or rode will enable you to feel the interaction between anchor and ground as it digs in. If you feel vibration and an occasional bump coming up the chain or rode, the anchor is sliding on the bottom. If the boat drags back slowly and then the anchor digs in, the bottom is probably composed of soft mud over firm bottom. With good holding—hard deep sand, for instance—the anchor will slide a short distance and then dig in hard.

Rock- or coral-infested bottoms require a bit more interpretation. The anchor will slide and bump along, catching occasionally and then breaking loose as the load builds.

You want to be careful in this situation not to be fooled into thinking you have a good bite when the anchor is temporarily locked onto a rock or coralhead. The holding may be okay in the direction you're pulling, but if the wind shifts a bit, the anchor may break free.

Help

An anchor that is well-dug-in sends a high-frequency, constant vibration up the rode or chain. Any other vibration indicates that the anchor is slipping. With enough power in reverse, the angle of the rode is straight and remains constant. If it tends to flex, that is another indication that your anchor is moving on the bottom.

Even where you have a steady tradewind breeze to hold you, be wary. Although coralheads may provide an initial hold, they are apt to break off eventually. The action of the chain or anchor grinding the soft coral weakens the head.

If the wind starts to pick up, or change in direction, you will hear the chain rumble as it moves across the bottom. This can be extremely loud below, and some folks find it disconcerting.

However, there is a pattern to the sound, and once you learn the pattern it will let you know that you are moving a bit but not dragging. If you start to drag, the pattern will change, and usually grow louder, too.

MOORINGS

Sooner or later you're going to find yourself in a situation where the use of a strange mooring is a convenience or a necessity. It may be that the anchorage is so crowded that short-scope moorings are required to fit everybody in. Perhaps the water is too deep to anchor, or the bottom is foul. Whatever the reason, there are a number of factors to evaluate before deciding to use the mooring.

The first question is, how protected is the anchorage? If it's landlocked, and there isn't a fetch for waves to build up, you're one step ahead of the game. Next question is the weather prognosis. A pleasant summer day can turn into a problem if severe line squalls are about. Next, what are the risks from dragging? If there's a mud or sand shoal to catch you, not much damage will be done if you start to move. But a rocky shore is something else. What about the other yachts moored nearby? They may pose the biggest hazard if things get tricky.

All of these questions must be factored against your time horizon. A short stay reduces exposure. But leaving your yacht for any extended period means you want to be sure to have the very best mooring system available.

A mooring system is similar in many respects to your anchoring gear, except it's usually a lot less efficient. Most moorings are limited in scope due to local crowding. A scope less than two-to-one isn't unusual. That increases the load at the "anchor" on the bottom.

If the anchor turns out to be a husky mushroom, designed specifically for moorings and buried in deep mud, there's a good chance it will stay in place. But concrete cubes or old engine blocks don't do much of a holding job under adverse conditions.

While you usually can't inspect the mooring system, you can ask a few questions. When were the chain and anchor last serviced? A biannual inspection is as far as most moorings should be allowed to run. How big is the anchor and of what type? How about chain size?

Mooring attachment:

What's on the bottom is only a part of the story. You also have to be concerned with your attachment to the mooring itself. It's always best to use your own mooring lines. To save problems when it's time to slip away, bring both ends back aboard rather than tying directly to the mooring. Make sure that the eye on the mooring won't chafe through your line, and be sure to use chafing gear at your bow chock.

Just because someone tells you that a certain yacht, much larger than yours, regularly uses the mooring, doesn't mean it will hold in a blow. But there's a good way to check out the system. Once you've secured, back down on the mooring, slowly at first. With a moderate engine load on the mooring, take some bearings to check position, and then steadily build up reverse power. If it begins to drag, you can equate that to how much wind strength the power setting on the engine would push you into.

Even with the biggest moorings it pays to have an alternate plan in case you begin to drag or a link in the system fails. Knowing how to exit your anchorage at night is the first line of defense. Always have your own ground tackle system at the ready. And sleep with one ear open.

Help

It is not only safest to anchor clear of coral, it also protects the coral from damage. This helps insure a long healthy life for the reefs and lagoons, which we all love so much.

Limon Cay in the San Blas Islands, on the east coast of Panama. These are some of the nicest islands in the tropics, inhabited by a wonderful group of people, the Kunas.

Anchoring is for the most part challenging, with lots of debris and coralheads on the bottom to foul the hook. In general, it is thin sand over hard base, so you need a big hook to hold if the weather deteriorates.

ANCHORING IN CORAL

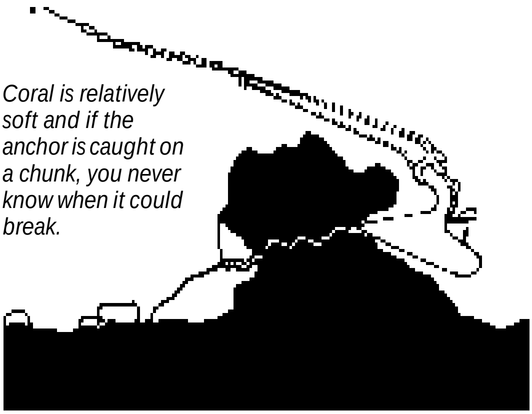
Tropical anchorages close to high islands or rivers often have mud or sand bottoms, where anchoring is not particularly challenging. But even with these locations you will find coral bottoms and coralheads. In many of the better cruising areas, coral is the norm.

Anchoring in coral does present difficulties, but they are not insurmountable. The main thing is to understand the risks, and make your decisions accordingly.

Finding a Clear Spot

If the water is clear and the weather conducive to good viewing, you will be able to see the bottom in 50 feet (15 meters) or more of depth. With a little height (see page **312** for more information on eyeball navigation in coral) you will be able to pick out the clear spots.

If this is your first visit to an anchorage, and if it is somewhat foul, allow plenty of time to find the right spot—maybe re-anchoring a time or two in the process.

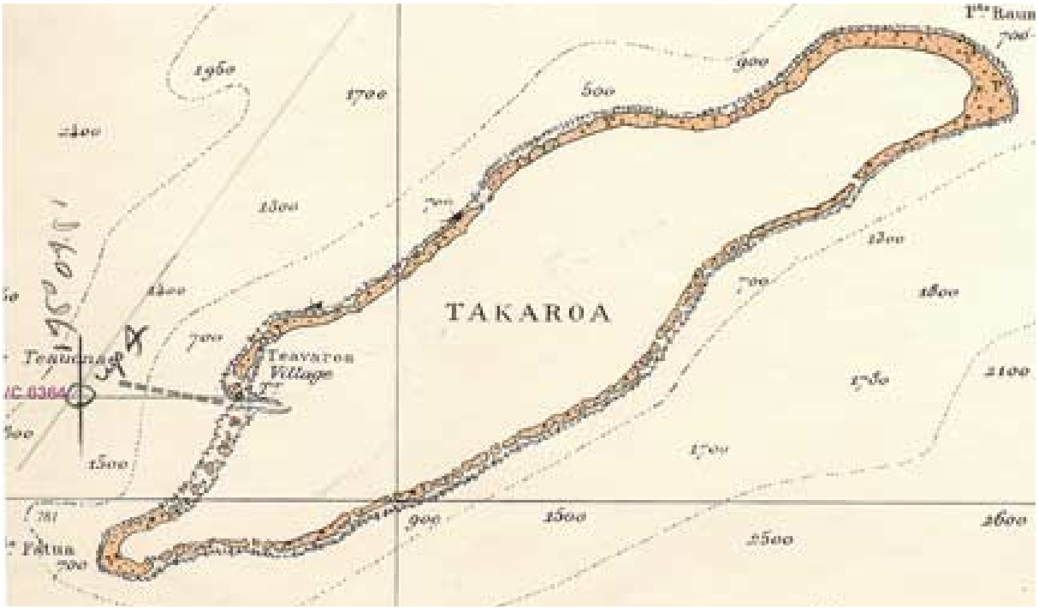


Coral is relatively soft and if the anchor is caught on a chunk, you never know when it could break.

Is the Anchor Really Dug In?

With a foul bottom it is difficult to tell if the anchor is properly dug in, or if it just snagged on a coralhead. With rocks, a good snag will typically hold you, at least until the wind shifts. But with coral, you are never sure if the head will hold, or crack and allow the anchor to break free.

Help



Special Issues inside Lagoons

There is usually one part of the lagoon which is well protected from the prevailing tradewinds. You snuggle up to the prevailing windward shore, get the hook well set, and as long as the trades stay where they are supposed to, everything is fine.

But occasionally the wind will shift. Perhaps it is a tropical convergence or shear line, and the wind goes from the northeast/southeast quadrant to the southwest or northwest. Now that weather shore has become a lee. Most lagoons are steep-to on the inside, so the odds are it is deep right up to the beach, and there are no landmarks from which you can get good bearings.

With the change in the weather comes overcast and sometimes rain, and often a pickup in wind. The odds are now that there are several miles of open fetch in which the waves can build. You may be trapped with no way out.

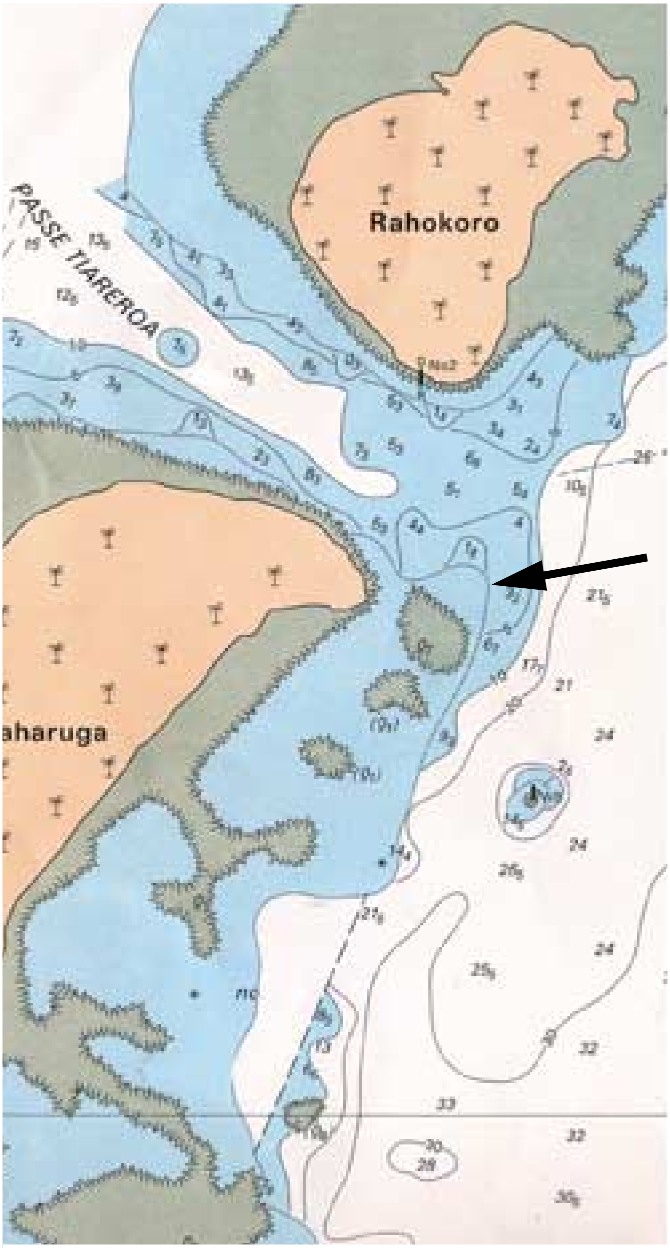
What can you do? What we have learned is to leave at the first sign of a change in the weather. Often the situation won't be serious, but if we suspect the potential for a major change, we leave for another island, or move to a better protected part of the current lagoon.

Now that selective availability has been turned off and GPSs are far more accurate, it may also be possible to work your way out of the atoll by retracing your way in. And while we would always advise keeping a close track on the GPS of the clear path in, using this when you cannot see well is not foolproof. Our choice will remain putting to sea if we are at all concerned.

The island above, Takaroa, is at the eastern end of the Tuamotus in French Polynesia. It is a lovely spot, with friendly people—one of our favorites in the South Pacific (which is probably why we've been back to visit four times!).

The village of Teavaroa is located on the leeward side of the lagoon and there is no protected anchorage nearby. There are three possibilities: One is to tie to the copra wharf in the pass (guaranteeing at least one copra rat stowaway). Two is to anchor just outside the lagoon in the lee of the village, Or three, work your way across the lagoon and anchor in the south corner, which is fine as long as the wind doesn't go to the northeast.

Help



A detail of the pass into Ahe in the Tuamotus (Tiareroa). Depths are in meters. This looks straightforward on the chart, and with good visibility, or if you've been in and out a few times, it isn't that difficult. But if the weather deteriorates and you are faced with a decision of whether to stay and take your risks inside the lagoon, or try the pass without good light, what do you do? Having stuck Beowulf on some coral leading to the southeast corner of Tiareroa (black arrow) in less than optimal light, we would not want to be faced with this decision. Once again, it is always better to leave early. You can always come back.

Use Chain

You probably have figured out that we don't advise using a rope rode when anchoring in coral. Rope cuts too easily, and coral presents far too many hazards.

But if you are caught in coral or on some other foul bottom without a continuous-chain rode, putting a float on the end of the chain-to-line intersection will reduce the chances of a bottom foul.

The float should be sized so just a few feet of chain floats clear of the seabed. However, initial holding will be reduced if the chain is too far off the bed.

It is also possible to use polypropylene (floating) rodes to keep them off the bottom. However, these are a danger to your (and other's) propellers.

Anchoring to a Coral-head

The time may come when you are faced with the unpalatable choice of being stuck inside a lagoon, with wind and chop trying to break a tenuous grip on the bottom.

One possibility to improve the situation is to work the chain several times around a large coralhead, using the head as a mooring (this usually happens on its own when you don't want the help!). This is not healthy for the coral, but in an emergency, where the boat is at risk, it will sometimes get the job done.

Anchoring outside Tropical Reefs

What if you find yourself off an island with a fringing reef and no pass into the lagoon?

It is possible to anchor off in such a situation. However, this must be done with care, keeping a close watch on conditions.

The issue, of course, is keeping yourself off the fringing reef. You will need a steady breeze to do this. If the wind quits or changes direction, or a change in the current swings you towards land, you and the boat must be ready to up anchor and move without hesitation.

The first time that we anchored off a fringing reef, we'd been talked into taking some Tuamotian friends from Takaroa to the neighboring island of Tikei.

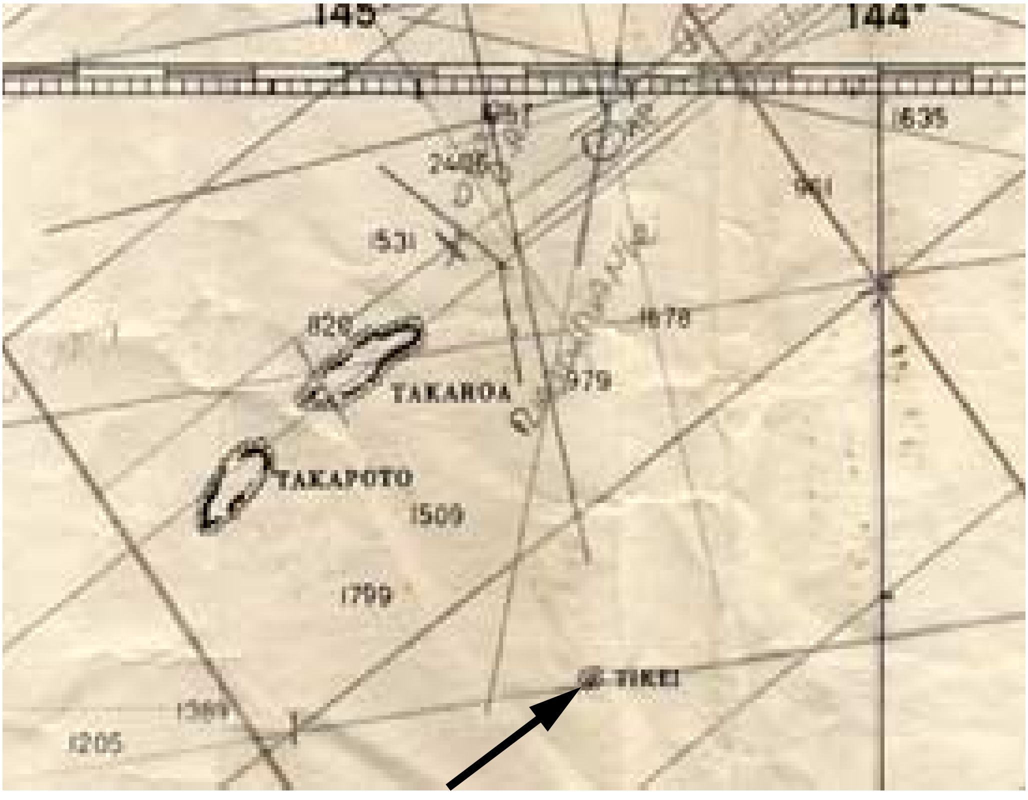
The way it was explained to us, Tikei had several different species of fish which these Takaroans liked for the change in taste. As our friend Henry put it, "It is the same as with your farm animals. We have sheep- and cow-tasting fish on Takaroa, but the pork fish are on Tikei."

The prospect of a short voyage with these Polynesian seafarers had us intrigued, as did the stories of the masses of lobster and coconut crab to be had.

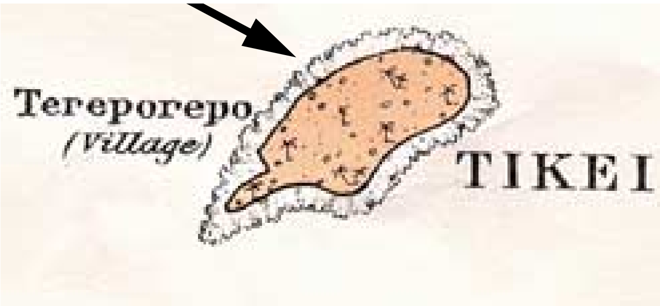
We did not have a detailed chart of Tikei, but Henry assured us there was a good anchorage.

The chart below is a scan from the actual chart we used for going through the Tuamotus. Not much on detail, but it was all that was available to us in the 1970s. (Today the French have excellent charts.) Our dead reckoning plots along with a couple of celestial LOPs can still be seen, as can the point at which we expected to see Takaroa on our primitive radar.

Tikei can be seen south-southeast of Takaroa. Note: the chart has been magnified by 40-percent to make it easier to read.



Help



A "detail" chart of Tiki. *Intermezzo's* anchorage is indicated by the black arrow.

Below is a photo from our main mast. Note the floats on the rode (under the black arrows) between the boat and the reef.

Intermezzo is sitting in deep water—65 feet (20 meters) and is being held in position away from the reef by the southeast tradewinds.

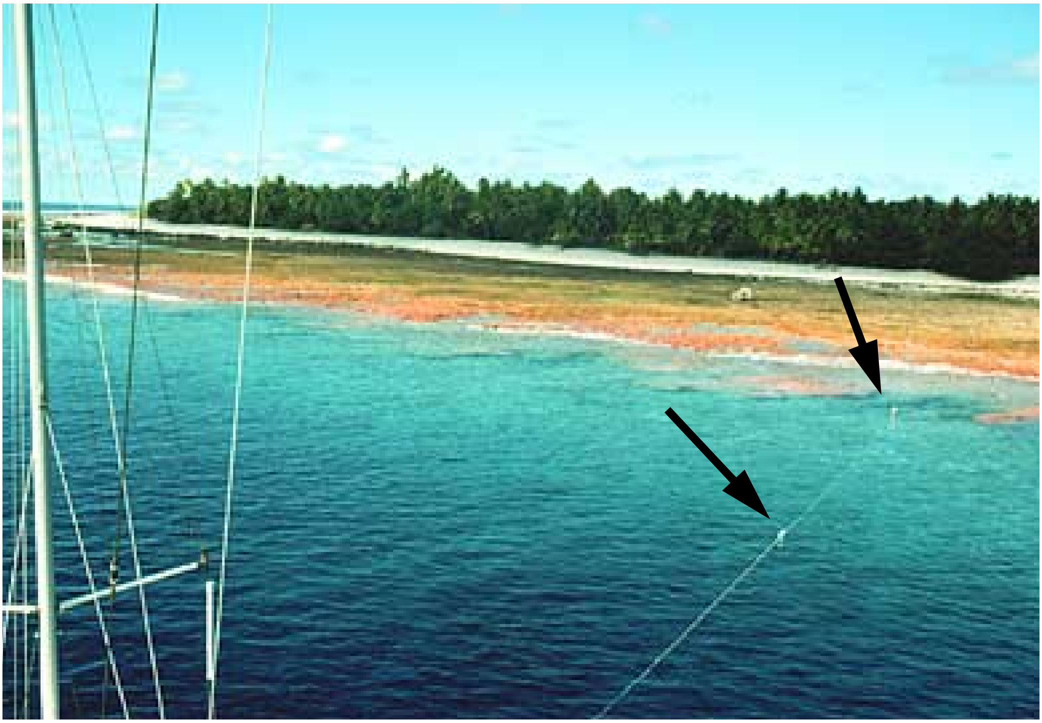
Tikei

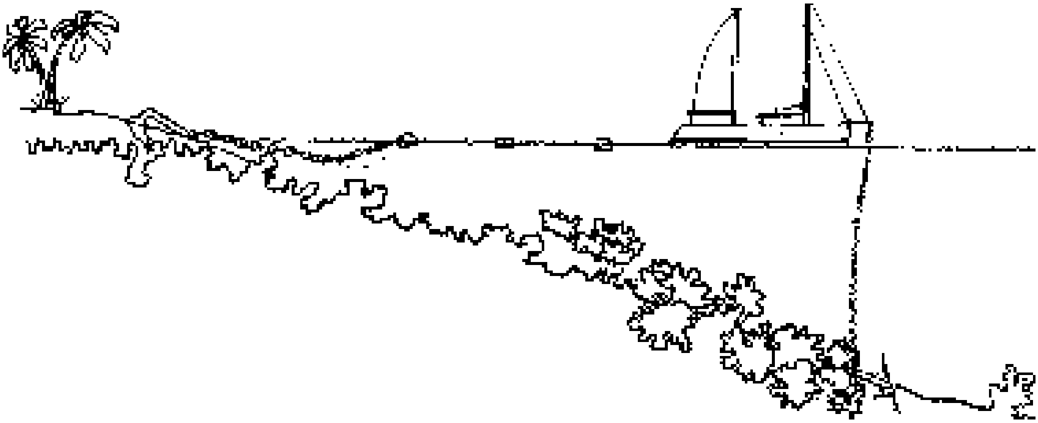
An overnight passage brought us to Tikei at first light. Our eight Takaroan guests were excited about the landfall, and talked enthusiastically about the fishing and crab-hunting to come.

As we approached the island we began to feel a little uncomfortable. The spot Henry had in mind for us to anchor would be fine for his 19-foot (6-meter) runabout, but was totally inadequate for *Intermezzo*.

We circled back and forth, watching the depthfinder and looking at the reef and bottom. Nowhere was there a clear spot with room to set the hook, or margin for us to swing toward the reef if the light southeast trades quit.

A major problem was the steeply shelving bottom. It made an easy 30-degree angle rising up to the sheer face of the fringing reef. There was simply no way our anchor would hold with that sort of a downhill angle. In addition, the bottom was fouled with coralheads. (Between the avid divers on board and scuba gear, we'd have no problem clearing a foul—*if there was time)*.





Anchoring Technique

After thinking about the problem for a few minutes we decided to try something we'd read about the copra schooners doing in the days of commercial sail.

We would take a stern hook ashore and set it on the reef, with a buoy marking its location.

This would work fine as long as the breeze held us off the reef. But we wanted some insurance in case the weather changed.

With the first anchor ashore we eased out 400 feet (122 meters) of nylon line (the anchor had a long chain lead for abrasion).

This brought the bow into 65 feet (20 meters) of water.

At this point, with the engine in reverse, keeping shore anchor rode taught, we slowly dropped our bow hook which had been buoyed in case it fouled. Once it was on the bottom, another 50 feet (15 meters) of chain was eased out.

A quick swim confirmed what we could see from the surface. The bow anchor would quickly foul a series of very large coralheads if we started to blow back towards shore.

These heads, plus the steeply shelving bottom would hold us if the breeze switched. While this might not be enough in a real blow, what we were looking for was a few minutes of time in which to clear the shore anchor and make offing if the weather deteriorated.

Just in case we had to exit quickly, preparations were made in advance to slip both bow and stern anchors.

The anchoring system we used at Tikei isn't pretty, but it worked. However, we would never have tried it without the potential assistance of some of the best free-divers in the world. Had the main anchor fouled, our Tuamotian friends could have easily freed it, without even resorting to our scuba gear.

Keeping Watch

We had been looking forward to exploring this uninhabited island. But after considering the situation in which we found ourselves, we decided to stay aboard—just in case.

As it turned out, the weather remained benign, the fishing, crab-hunting, and lobstering were great, and we had a wonderful evening sail back to Takaroa.

The experience was interesting. But in hindsight, if we were faced with a similar situation again, we'd heave to off the island, put everyone ashore, and sail back and forth until it was time to pick them up again.

RAFTING

Rafting up with one or more vessels is generally a bad idea. The loads on any single anchor system are greatly increased, you have to be concerned with wakes or waves banging the boats together, and if more than one hook is set off the bows of the raftees, there is danger of tangling.

If you must, it should be done with care, and only in the most settled weather in a fully protected anchorage.

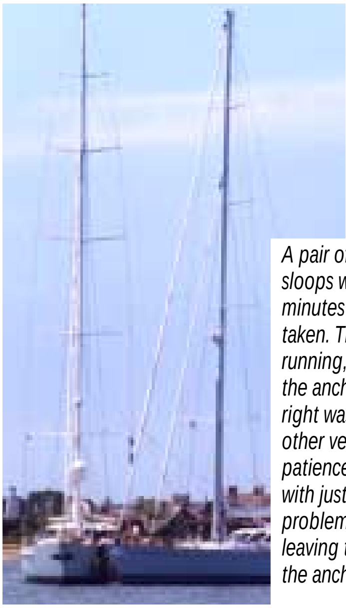
If more than one hook is set, keep well separated to avoid the chance of fouling. A stern anchor or anchors may be required to keep you headed in one direction. (If two anchors are set off the bow, and you rotate around them, a real mess will ensue when the time comes to retrieve the anchoring gear!)

Masts need to be staggered, so that if the boats are rocked by a wake the masts and rigging cannot bang.

Finally, lots of fenders are in order.

We generally avoid rafting, unless it is very protected and exceptionally calm—as above in British Columbia. Sundeer is rafted alongside Steve's father's boat, Deerfoot II, and we're lying on a single anchor.

Middle right is the "Dolan Mob" during Antigua Race Week. That's Sagamore, an ILC Maxi to the right and a Swan 57 all the way to the left. All of the large boats between the racers have their anchors set.



A pair of 120 plus foot (37 meter) sloops which had been rafted a few minutes before these photos were taken. There was quite a bit of current running, and as they tried to separate the anchor chain of the boat on the right was swept under the bow of the other vessel. Using thrusters and patience they eventually separated with just scratched bottom paint. The problem could have been avoided by leaving the boats tied together until the anchor had been raised.

Help

Anchoring with Extreme Tides

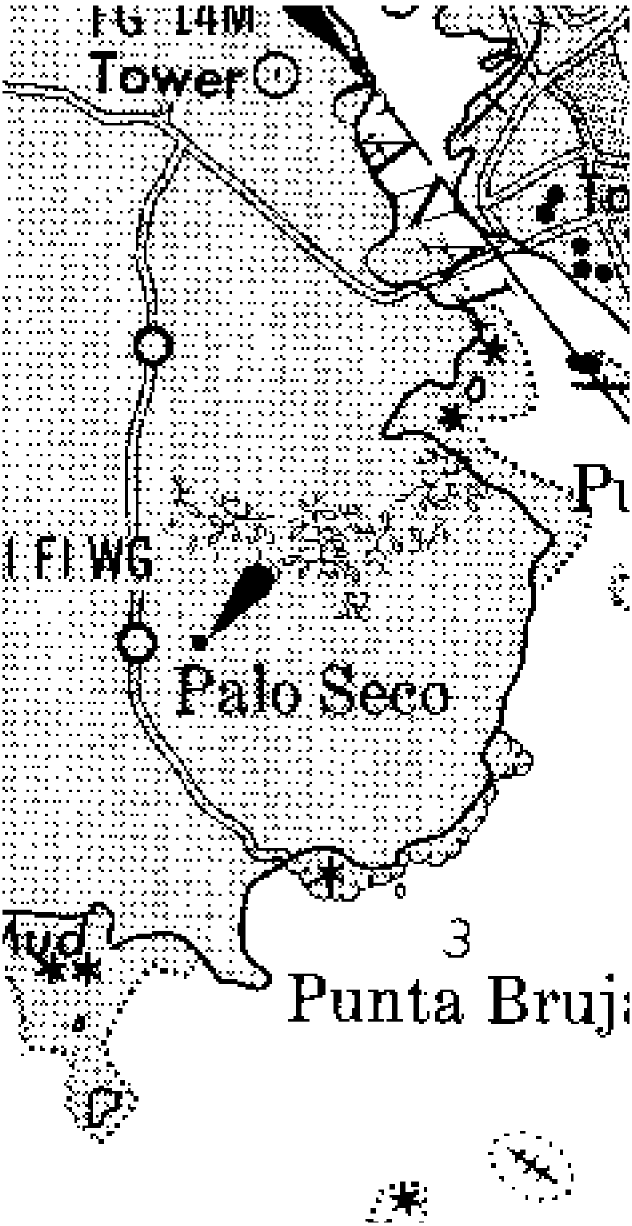
Here's one more reason why cruisers should pay attention to tidal heights and cycles. Move with us now to Taboga Island off the coast of Panama.

Intermezzo II has just finished her first transit of the Panama Canal and rests quietly with a fleet of other cruising yachts in a large semicircular bay. Here, with all that ocean water piling up against the Panamanian shore, 10- to 15-foot (3-to-5-meter) tides are the rule. Space is tight and after setting our big Bruce anchor in full reverse, we shorten up the chain to three-to-one scope.

That afternoon we walk ashore to find a bakery. On our way down the beach we see a large modern schooner that appears to be careened. Closer inspection shows that rather than being careened, she is on the rocks. She has a hole punched into her side, and the decks are slowly being inundated by the incoming tide. It is a sad sight—I can't bring myself to photograph her.

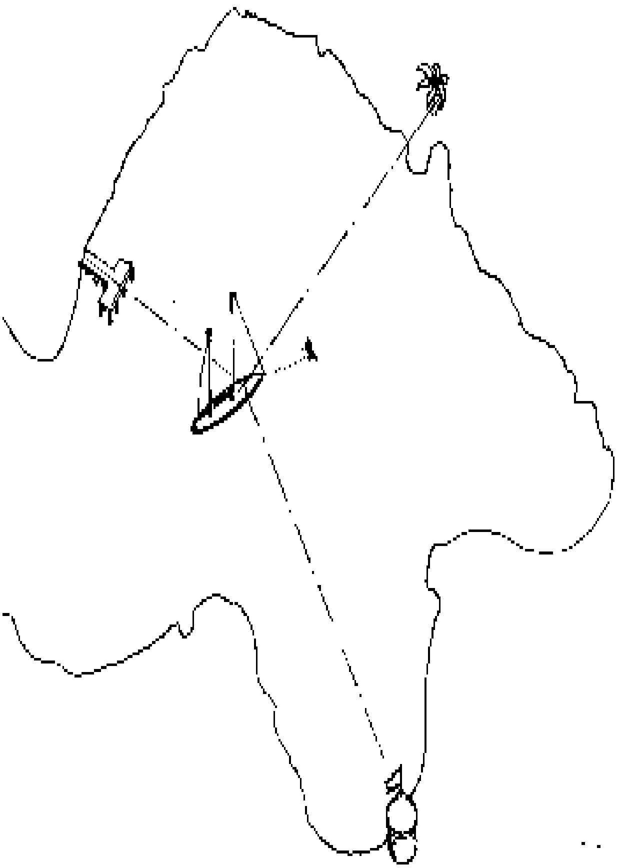
We find the bakery, and after a brief exploration we begin rowing back to *Intermezzo II*. The tide is now reaching its maximum height, with the quiet beach on our port side disappearing. At high water we discover we are anchored in 22 feet (7 meters), and have almost one-to-one scope on the anchor. A gentle wave is all that is required to lift our giant Bruce right out of the seabed. Had we stopped for some more postcards...

The lesson here is to be aware of the tide, both in terms of having enough water at low tide to float, and not so much at high tide that anchor holding is compromised.



Taboga, Panama is conveniently close to the Panama Canal Zone. You can hang out here in pleasant surroundings while awaiting your turn through the Canal.

Help



Anchor Watch

When I was growing up my dad usually had us maintain an anchor watch unless we were absolutely secure in a protected anchorage with calm winds.

This meant someone was in the cockpit, keeping an eye on things, ready to wake the captain (my dad) if anything was amiss.

Some years later (would you believe 50!) the use of more efficient anchors and better position-fixing equipment has made a formal anchor watch, in most conditions, unnecessary.

However, if the weather is questionable or the anchorage insecure, it makes sense to set an alarm clock and check periodically.

Position Fixing

Once the hook is down, and we've set it under power, the first thing one of us does is to take shore bearings. We like to do this first visually, picking three or four prominent landmarks, and then with radar.

Visual bearings, taken on significant shoreside features, are the best way to make sure the anchor is holding.

Write these bearings down in the log to keep the data handy.

It also works to use radar bearings with multiple cursor and electronic range rings.

Using the radar we'll take at least two bearings and two distance measurements.

Nowadays, with GPS, we'll also put in a waypoint for our coordinates.

All of this data is noted in the log, along with the depth. If there is any question about interpretation, we'll make a quick sketch in the log as well.

Sometimes it is difficult to tell whether or not you are dragging, especially in remote areas if you have no radar.

One method we've used with some success is to set the dinghy anchor off our cockpit at a distance where we won't rotate over it. Tying the rode to one of our fenders gives us a target which we can easily illuminate with a flashlight at night. This is a simple and effective way to see if we are drifting.

Before Settling Down

At the same time we are writing the position data in the log, we also review once again the risk factors in the anchorage we've just chosen.

Could the anchorage, protected for now, become a dangerous lee shore? (For more information on this topic see page 403.) We may have no

Help

choice but to stay in an exposed cove, but in that case, we need to keep a wary eye on the weather and not wait until the last minute to leave should the situation deteriorate.

Rather than rushing off the boat as soon as the anchor is set, we like to take some time to look around and decide if we can leave at night or when the sky is overcast.

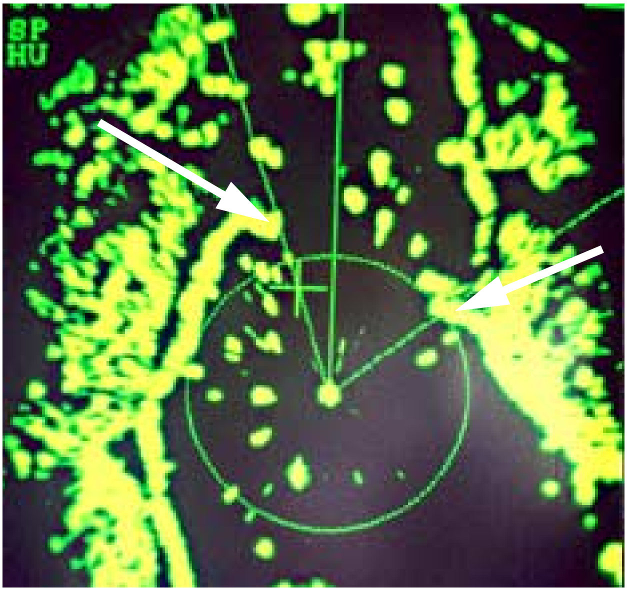
As previously mentioned, many tropical anchorages require good sunlight to exit, with the sun at the correct angle behind you so that the reefs or heads can be seen clearly.

Even if the steady tradewinds are blowing, we consider what will occur if a sudden trough of low pressure develops and the wind reverses and picks up to gale force. It has happened to us before, and we expect it to happen again.

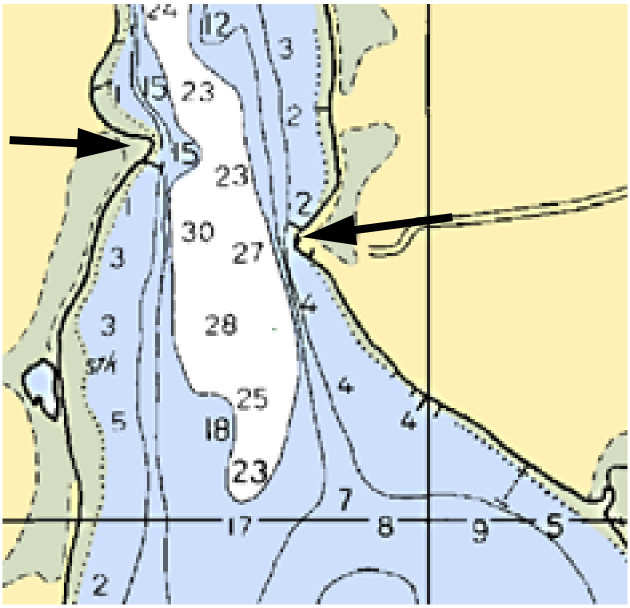
After reviewing all the possibilities we write down a couple of notes on how to exit if visibility is impaired.

This may be as simple as the compass course to steer and distance off to maintain. There may be additional notes about special landmarks, radar echoes, and obstructions. And now with selective availability turned off on GPSs, we have the possibility of backtracking on our course into the anchorage.

If we have to leave in a hurry, we don't want to be spending time working these details out when we should be putting to sea.



The anchorage at Edgartown on Martha's Vineyard (in the New England region of the United States) is extremely tight. The bottom is medium-hard mud. With a large anchor, it will hold well in storm conditions. To tell if you are dragging, visual bearings make sense in the day. But at night, without shore lights, radar is the answer. In the radar image above, we've taken bearings on two points of land (shown with arrows on the chart below) and a distance off these points with the range ring. The best time to set up radar bearings is during the day, when you can check position visually against the radar. Note the small targets scattered to the left. These are other anchored vessels.



Help

Signs of a dragging anchor:

Bearings and electronic nav aids will not always tell you if you are dragging, especially if the anchor movement along the bottom is slight.

However, the actions of the boat and anchor rode give major signals when the anchor starts to slip:

- ❏ The first is the bow heading off the wind. As you slip back, the bow will fall off in the breeze (the exception is when you have a riding sail set).
- ❏ If the bow has been shearing back and forth, it will no longer do so. Rather, it will fall off to one side and stay there.
- ❏ The next clue comes from the anchor rode. Whereas before it was tight, with a modest amount of catenary, when the anchor drags the rode will usually bounce up and down, and alternately go tight and then slack.
- ❏ Finally, if you are anchored over rock or coral, the chain will telegraph the sound of its sliding along the bottom.

Electronic Anchor Watch

We've had several friends who like to use the delta alarms on their depthfinders as an alarm. By setting both high and low limits (with due allowance for tidal range) they are alerted when the bottom depth changes outside of this range.

The depthsounder beeps, and then you know to get up and investigate.

Over the years we have used the alarm features on various radars for the same purpose. We put a guard zone or sector just before whatever is downwind (or downcurrent) of our position. This is quite effective, but requires a fair amount of power.

GPS is of course great for this feature. But if a grounding would be especially detrimental, it makes sense to use both radar and GPS.

Telltale Compass

We like to have a telltale compass over the bunk. The compass, mounted above our heads, allows us to crack an eye, glance at our heading, and fall back asleep without getting up. Before we added the telltale, one or both of us were up and down like a jackrabbit all night whenever we anchored in unprotected waters.

Wind Alarm

It goes without saying that the major risk when anchored comes from wind. Most of us wake up at even a slight change in the weather. However, if you are a heavy sleeper, there is a sophisticated yet easy way to install a wind alarm system.

Take one of your headsail halyards, set it up nice and tight just ahead of the mast, and any time the breeze comes up the halyard will start to slap.

If Conditions Deteriorate

At some point you are going to be anchored in what you thought was a nice, protected anchorage and conditions will deteriorate. It may be an open roadstead, with an easy exit to the sea, or you may be stuck inside of a lagoon, unable to move due to lack of visibility.

As we've said repeatedly, if you can get out, it is always better to put to sea early, before things get worse. Sure, you may be giving up a comfortable anchorage for a night offshore, but you can always heave to until daylight, and if things are not really that bad head back in and anchor again.

Talking with Your Neighbors

The odds are you will be sharing your anchorage with other yachts. The norm is to chat back and forth about the conditions, debating whether people should leave, or just let out some more scope and ride it out.

There's a certain feeling of security that comes from having other boats close by, and adopting uniform tactics.

However, don't be lulled into a false sense of security. The neighbors may not think things warrant leaving, and you may be talked into staying.

Then the situation deteriorates and you are trapped.

It is always better to clear out when in doubt, regardless of what your neighbors are doing.

Setting a Second Anchor

If you are trapped and cannot get out, and the wind and sea start to build, you can set a second anchor as an extra measure of defense. The longer you put this off, the more difficult it becomes. Better to act early.

If the second hook is easily accessed, and the rode is already flaked out there will be less reluctance to act early (as opposed to having to go on deck, get wet and cold, and dig everything out of the forepeak or lazarette).

If you do not have an easily set second hook, at the first hint of trouble dig out the gear and flake out the rode so you are ready to set should the need arise.

Once you decide to set the second anchor you will need to think about where it should be dropped. Ideally, this will be in a position so that in the strongest winds the boat is bridled between the two anchors.

If you can power up with the engine to set the second anchor, take care that you do not set it on top of or ahead of the first hook. To do otherwise risks a foul between the two anchors, which makes matters worse rather than better.

Using the Engine

At some point, regardless of your anchoring gear, it may be necessary to use the engine to relieve strain on the rode and anchor.

This approach has been used many times, saving lots of anchored vessels in horrendous conditions.

The difficult part is not overrunning the anchor. You want the rode(s) to be moderately tight, but certainly not loose.

Usually this is accomplished with a few seconds of ahead, then back to neutral.

To maintain the correct heading, almost always directly into the wind, some form of wind indicator is required. Ideally there will be a wind instrument viewable from the helm. If not, tie some telltales on the rigging where they are easily seen from the engine control position.

If the bow is shearing off, sailing back and forth, take care not to make the situation worse with the engine.

Since this is a technique involving some finesse, our suggestion is that the next time you are anchored and it starts to blow, give it a try. Practice using the engine to reduce the load on the anchoring system. By working with the engine now, when you don't need it, you will be much better prepared if the day comes when it is essential to your survival.

Risks from Other Vessels

By far the biggest risks when anchored in difficult situations comes from other vessels, both commercial and yachts.

If the wind really starts to blow reducing windage diminishes anchor load (and mitigates sailing back and forth on the anchor).

- ❏ Remove roller-furled sails.
- ❏ Bring mast-stowed spinnaker booms on deck.
- ❏ Take down awnings and folding dodgers.
- ❏ In extreme conditions remove external halyards, or pull them to the masthead with a figure-eight knot (leaving one on which to go aloft and retrieve the others later).

How big an anchor is big enough? Our feeling is that it is better to take the weight of the second hook, and add it to the primary anchor, so the one really big hook is the everyday workhorse.

That's why we've always had such big hooks on our boats, and specified them for our clients. Does this approach work?

With almost 60,000 miles of cruising on *Sundeer* and *Beowulf*, we've never had to set a second anchor, and only dragged marginally a couple of times.

Help

Anytime the prop is turning, there is risk of fouling it in the anchor line (yours or someone else's), the dinghy painter, or just a piece of running rigging which could be hanging over the side.

At some point you are going to stop the engine this way. If it hasn't happened yet—it will. It is just a matter of time. The key thing is not to let it happen when this could put the vessel at risk.

And when it does happen, be ready to sail your way out of trouble. This means having the halyards attached, sail covers removed, and awnings stowed whenever prop failure could put the boat in danger.

The odds are these vessels, typically large, will be left unattended while their crews seek shelter ashore, when conditions turn bad.

If another boat is dragging down on you, the increased load of the two boats hooked together will probably cause your own anchoring system to fail. So you need to keep an eye out, and then try to maneuver under power out of the way of other draggers.

Slipping the Anchor

You may one day need to leave in a hurry. The anchor might be fouled, the windlass inoperative, or it may just take too long to bring the anchor up.

If this happens, the normal procedure is to "slip" the anchor. This means let the rode run out, securing a buoy to the bitter end. A fender usually does a good job as a marker.

If anchored in deep water with heavy chain, you will want to take a look at the buoyancy of the fender compared to the weight of the chain.

To do this, take the water depth, multiply it by the weight per foot of your chain, and divide this amount by 64. The answer will come out in cubic feet of required buoyancy. Check the buoyancy of your fenders, add a 100-percent safety factor, and you are set.

This is much simpler than it sounds. Here's an example.

Say you are anchored in 65 feet of water with 3/8-inch BBB chain. The chain weighs roughly 1.4 pounds per foot so 65 x 1.4 = 91 pounds. Divide this by 64 (91/64 = 1.42 cubic feet). Double this volume 2 x 1.42 = 2.84 cubic feet, and then check it against your fender volume.

The ultimate tropical anchorage, Cocos Keeling atoll in the southern Indian Ocean. However, the large size of the anchorage means that dangerous waves can build up when the wind switches. The entrance is narrow and requires good light. So, if the weather looks threatening it is best to leave early, before visibility deteriorates to the point where you are forced to stay. Often putting to sea like this will be based on a false alarm. But it is always better to leave early than to be caught. Remember, when in doubt get out (early).

Help

Special Precautions

Anchoring in heavy weather may require special procedures. You will want to reduce the shock loading of the anchor as the wind gusts and your boat sheers. Nylon rode does this automatically, but on chain the anchor could be broken free from the bottom if the surge loads are transmitted to the anchor directly. To reduce the chances of this happening, use some form of shock absorber.

Shock Absorbers

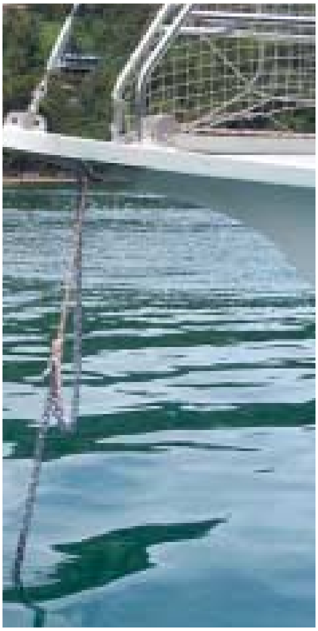
Larger yachts occasionally have spring-loaded chain stoppers for this purpose. We prefer to tie light-duty three-strand nylon between the bow cleats and the chain. In heavy winds we use a 20-foot (6-meter) long piece, which will stretch 4 or 5 feet (1.3 meters) under load.

The chain is left in a loose loop between the cleat and the end of the nylon, so as the nylon reaches the end of its stretch, the chain again takes the load directly.

This line should be the smallest that will take the load, in order to provide the most elasticity. (The smaller it is, the more elastic.) On *Intermezzo*, a moderate windage vessel, we used a piece of 5/16-inch (8-millimeter) nylon and never had a problem. *Intermezzo II*, with perhaps 50-percent more windage, used a 3/8-inch (9.6-millimeter) piece of line. On both *Sundeer* and *Beowulf* we use 7/16-inch (11-millimeter) three-strand nylon.

In a really heavy blow, or with a sea running, even if you have unlimited swinging room and lots of chain veered, at some point the chain will snub up tight. If this happens the single-shock line shock absorber should be augmented with a second line.

Another way to reduce loads is to lower the attachment point of the rode on your bow to an eye at the cutwater. The lower pull flattens the angle point of the rode to your bow.

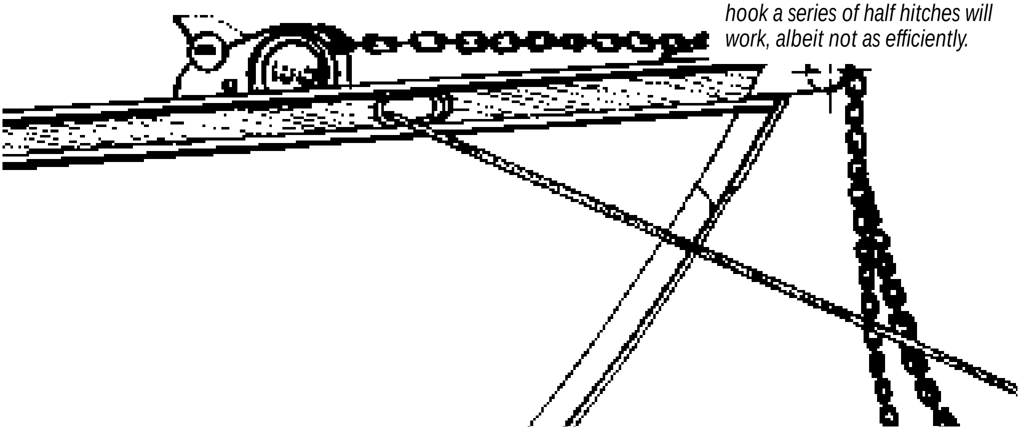


A chain hook (shown above and in the drawing below) is the easiest way to connect a snubber to the anchor rode.

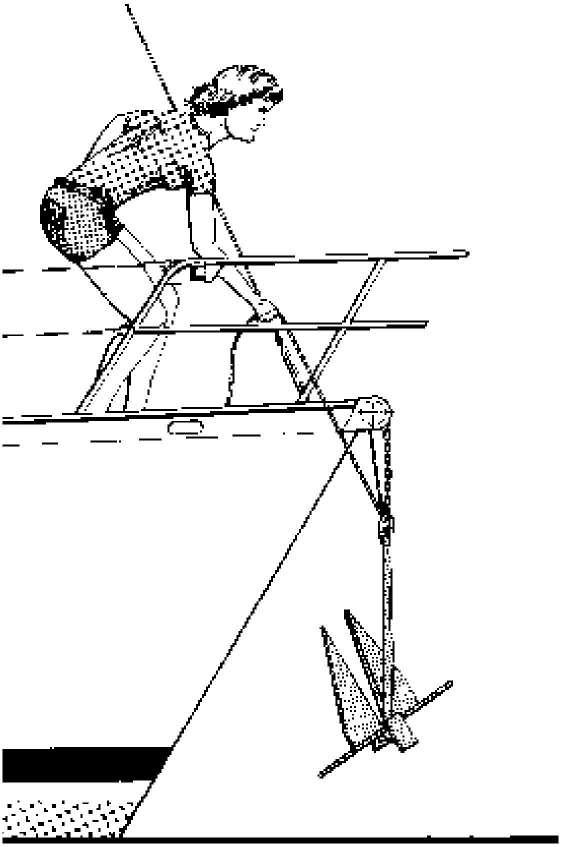
The longer the snubber line, the better the shock absorbing characteristics. The snubber in the photo above is much too short.

In the drawing below, note the attachment for the snubber line at the cutwater. This substantially reduces the amount of rode required to achieve a given scope, especially in shallow water where the freeboard forward can increase rode needs by 30 percent or more.

Note: In the absence of a chain hook a series of half hitches will work, albeit not as efficiently.



Help



An efficient place to tie the trip line is the upper or middle rail of the pulpit, where it is within easy reach.

Rode Chafe

Anchor rope must be protected from chafe. Under high load, any sort of a burr or sharp edge will cut through the rope quickly, so be sure your anchor rollers and chocks are smooth.

Have plenty of chafing gear handy, and secure it tightly to the rode. As the anchor line stretches and contracts, chafing gear tends to move around, so check the rode condition frequently.

The best system we've found for chafe gear is split-nylon-reinforced vinyl hose. We usually use a two-foot (600-millimeter) piece, with holes drilled at the ends and middle. We thread light line through the holes and use it to tie the hose in place on the rode.

If you find it impossible to keep chafe gear on, ease the rode a few inches (50 millimeters or so) every half an hour to reduce the possibility of chafing one spot badly.

Rapid Anchor Deployment

There are times when the weather or lack of room in an anchorage require the anchor to be deployed quickly. If the anchor is at all difficult to launch, or if the windlass is hard to release, it makes a lot of sense to have the anchor deployed over the bow roller, ready to go.

Our own habit is to kick the anchor over the bow roller well before we enter a new anchorage. And upon departure, we don't bring it all the way home until we are totally clear and there is no longer the possibility of an emergency use of the anchor.

It is not uncommon today to have a windlass which powers up and down. We use a Maxwell windlass on *Beowulf* and it is a great boon, most of the time. But if we want to get the anchor out fast, the clutch needs to be released (rather than relying on the electric motor to power down) meaning that the clutch handle has to be handy, not buried in the bottom of a locker.

With anchors on rope rodes, the best system is to kick them over the bow, with the chain ready to run cleanly and the rode flaked down the deck (or in its rope locker), so no fouls can occur. The anchor is held by a moderate-sized piece of line with half a bow knot (or a light piece of line which can be cut). At the critical moment when you want the anchor deployed, it is instantly ready to go.

Anchor Lights

There are several schools of thought on anchor lights. Many sailors use masthead lights which are visible over a long distance. However, there are several drawbacks.

First, they usually take a fair bit of power. Second, you need to turn them on and off manually. For us, this usually results in forgetting to turn the light off in the morning, which equates to a lot of extra power consumption.

On larger vessels the light may be high enough off the water to make it difficult to see when another boat is close by.

For these reasons we prefer to use a low-level light. There are several lantern battery-powered units on the market with automatic on/off switches.

Nonetheless whenever we leave the boat we use our masthead light. This provides us with a good reference from the dinghy, and also allows us to keep an eye on the boat's position while we're ashore.

In 1995 a lovely yacht was lost at Ahe in the Tuamotus while the owners were having dinner with some fellow cruisers. She dragged her anchor and drifted several miles across the lagoon where she lodged against the reef. Despite a frantic, intensive search they were unable to find her that evening: They'd left their masthead anchor light off! The next day when she was found it was too late to save her. Had the light been on, they would have seen where she had lodged, and been able to take immediate action before the sea did its damage.

Anchor buoys: If there is doubt about the condition of the bottom, use an anchor buoy. This line is attached to the head of the anchor and can be used as a trip line if the anchor fouls.

It is also a good idea to use a buoy on second hooks. Make sure there is plenty of length to the trip line, so there is no chance of the float lifting the anchor as the tide rises!

Anchor buoys on a separate small (dinghy) anchor can also be used for a reference point to see if you are dragging.

Riding Sails

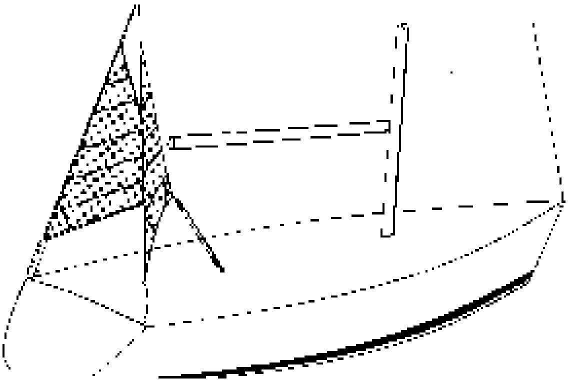
Another method to substantially reduce anchor loads in a blow is with a riding sail, as an experience of ours in Papua New Guinea illustrates.

The four volcanic calderas surrounding Rabaul harbor trip the bottom edges of the rapidly moving cumulous clouds. As the wind whistles down from the hills, growing stronger, yachts tug at their anchors, sheering first to starboard and then to port. Aboard *Intermezzo* our chief concern is that one of our neighbors may start to drag down upon us.

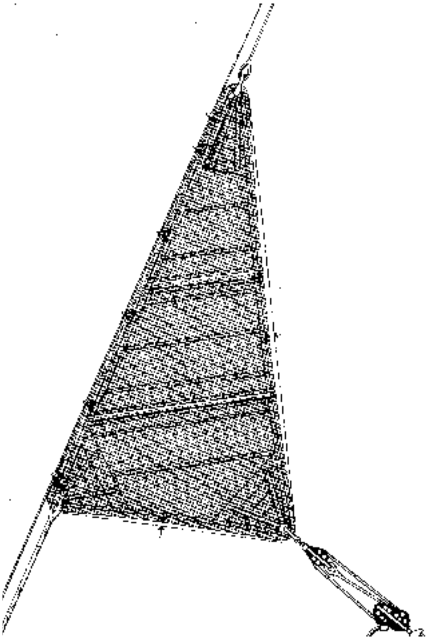
About us are all manner of yachts, from heavy-displacement, long-keeled boats to modern fin-keeled cruisers; some are built of ferrocement, many of steel, a few of wood, and others of fiberglass. Of the single-

Intermezzo with riding sail set and forward jib furled to reduce windage. The weather cloths aft (and the laundry) also help to keep her head to wind.

Help



With single-stickers there are several ways to make a riding sail. On a split backstay you can use a "toed-in" pair of sails. This is the best approach as the sails typically lie very quietly. The alternative (below) is to use a storm jib, or better yet, a purpose-built fully-battened riding sail.



stickers, one characteristic is evident regardless of design type or construction material. All weave back and forth on their rodes.

Sailing at Anchor

Sheering is caused by wind action of the topsides and rigging. The boat's tendency to sheer is affected by the location of its center of windage (without sails), relative to its underwater center of lateral resistance. In a wind shift the bow naturally wants to blow off until it is well off the wind. When the boat reaches a 30- to 40-degree angle to the wind, the rode forces the boat to "tack", and she begins to sheer in the opposite direction.

Sheering produces an uncomfortable motion. The wind will also cause many vessels to heel considerably, and the quick rolls from side to side as they zoom back and forth on their tethers make it difficult to get any sort of rest.

Worse than the discomfort, though, are the loads on the ground tackle system. An increase in direct tension of as much as 200-percent can result. If the holding is less than ideal, or if local conditions necessitate short scope, the extra loads may break the anchor free.

Intermezzo, however, rides serenely on her double anchors. She exhibits a slight tendency to head off, but then quickly points her stem back into the wind. Aboard, we are comfortable, and all hands except for the anchor watch sleep well this evening. The secret is her riding sail. The small, heavily built mizzen acts as a weathercock to keep her bow into the wind.

Using a Riding Sail

The ability to deploy a riding sail is not limited to boats with split rigs. Cutters and sloops can rig a riding sail from the backstay by seizing a block about 40-percent of the distance to the masthead to accommodate a short riding sail halyard or simply by using the main halyard.

The sheet is led forward, usually to the main boom traveler, a cleat, or padeye amidships.

Help

How large should a riding sail be? A sail the size of a storm jib will do nicely, or use 8-percent of total measured sail area as a rule of thumb.

Consider also building in a means of reducing this area. A sail that works well in moderate conditions may tend to overpower you in heavy-weather wind shifts. The solution used by several of our cruising friends with backstay riding sails is to have a second storm-sized riding sail for that once-in-a-lifetime ultimate blow at anchor. It is about half the size of their smallest storm jib.

A riding sail should be built from storm jib-weight cloth. The loads on it will be moderate, but it will spend many hours aloft.

We have employed both used sails cut down to suit, and new Dacron sails. When our budget has allowed a new riding sail, we have opted for ultraviolet-stabilized cloth, triple-stitched. The cut should be board flat, with a hollowed leech, luff, and foot.

Full-length Battens—A Must

Full-length battens in a mizzen or backstay riding sail will reduce or eliminate chatter in the sail. Solid fiberglass battens work best. We have found it better to bolt the battens into their pockets with locknuts rather than tie them in; ties can loosen or chafe through. Sails set on the backstay should have closely spaced hanks, and top- and bottommost hanks should be oversized.

You should *not* use conventional sails and storm jibs as riding sails except in an emergency, in part because of the ultraviolet degradation that results from prolonged exposure. With storm sails, in particular, you will want to know they are at 100-percent strength when you need them.

How large do you go? On our first *Intermezzo*, a 100-square-foot (9.5-square-meter) mizzen, which we could reef as needed, worked very well. Aboard *Intermezzo II* we used twin sails to take advantage of her double backstays. These were 15 square feet (1.4 square meters) each. Although the two sails were very small, the inboard angle they formed would hold us rock steady.

There is a light-weather advantage to riding sails as well. When the air is shifty, they will help keep you weathercocked, improving both ventilation and comfort below.

The next time you anchor, temporarily try out a storm jib or staysail on the backstay. You will find the difference in comfort amazing.

The boat in the photo below is riding nicely head-to-wind with her unbattened mizzen. Yet, when the breeze builds, between the lack of battens and the draft of the sail, it will begin to slat back and forth. This is hard on the sail, and very tough on the crew.

Help

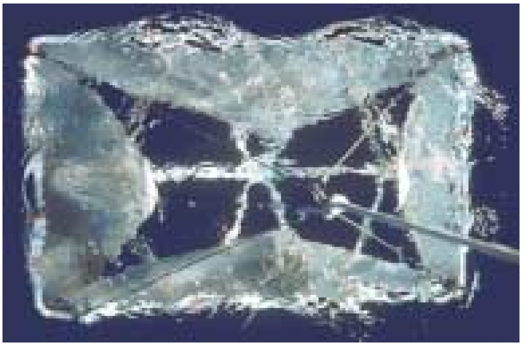
ROLL CONTROL

Nothing will ruin an idyllic anchorage faster than a slight swell running under your hull while the wind holds you beam-to the sea. With a typical sailboat, with lots of weight in the rig (high polar moments) and heavily ballasted keel, you have a perfect recipe for a pendulum.

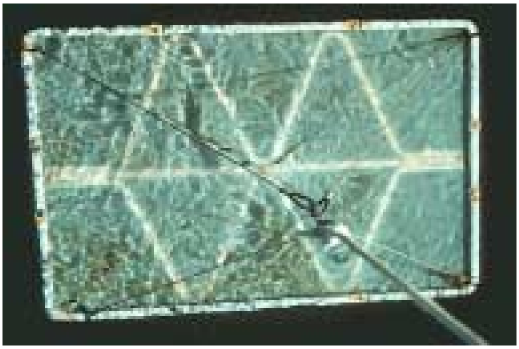
Once that beam swell starts the hull moving, without the benefit of the steadying sail normally carried at sea, it takes very little energy to keep up the roll. Back and forth you go, with an accompanying symphony of cans, bottles, and deodorant sticks as they clatter back and forth in their respective lockers.

This problem is most common to sailors on the US West Coast, but it can happen in any anchorage which doesn't afford 360-degree protection from the sea. It also gets uncomfortable in protected spots when strong tides oppose or run at angles to wind chop.

Fortunately, the same factors which make a pendulum-type motion so easy to start also make it simple to dampen. You just need a means of breaking or resisting the rhythm, so that when hit, the boat will give an initial rock and will then recover quickly. Gone is the *continuous* motion which can be so annoying and uncomfortable.



Flopper-stoppers in action. As the boat rolls downward, the plastic "valves" open. When the boat starts to roll in the opposite direction, (bottom photo) they close. Take this difference in resistance, and multiply it by the length of the spinnaker pole to which these devices are attached, and you'll see that the total restoring force is quite high.



Flopper-Stopper

Years ago the fishermen in the Pacific Northwest started using paravanes carried from special outriggers to help steady them at sea. By leaving the vanes rigged when they sought shelter behind headlands, they were able to reduce motion at anchor. Then, about 30 years ago cruisers starting making flopper-stoppers patterned after the paravanes but with a major improvement: whereas paravanes require motion through the water to be effective, these flopper-stoppers used a valve action to dampen motion. When rigged from the end of a spinnaker pole or main boom they have tremendous leverage—a very small flopper-stopper can do an enormous amount of work.

The valve action lets the roll controller drop down into the sea, unhindered as the hull responds to the initial wave energy. As the hull begins to roll back upright, the valves close, creating resistance to movement. Because this resistance is located at the end of a long lever arm (the spinnaker

Help

pole or main boom), the small amount of counterforce generated by the flopper-stopper is magnified. A surprisingly small amount of force will stop large boats from rolling.

When we first started cruising we carried a flopper-stopper made from a cast iron frame with plastic sheeting cut on the diagonals to provide valve action. This unit measured just 18 by 24 inches (460 by 610 millimeters), yet sitting at the end of a 16-foot (4.9-meter) long spinnaker pole would hold *Intermezzo* nice and steady in almost any sort of cross swell. That same unit also worked on *Intermezzo II*, and later provided stability for the much larger *Sundeer*.

A number of commercially made units are on the market—or, it's quite easy to make one yourself.

Sundeer (below) with a single flopper-stopper rigged off her spinnaker pole.

We used the spinnaker halyard as a topping lift to support the pole end and take the force of the flopper-stopper.

The normal topping lift was not strong enough for prolonged usage.

Rigging the Flopper-Stopper

First, the boom or spinnaker pole must be supported at the outer end. Topping lifts usually have too much stretch, and are not really strong enough. We find that using the spinnaker halyard or main halyard works much better. If you use the main halyard, be sure the lead over the sheave at the masthead is fair. If the halyard comes off at an angle, across the sheave edge, it will eventually weaken and fail.

Because of this, it is usually better to use the spinnaker boom (since the spinnaker halyard block has a better lead), or rig an external block on the back of the mainmast crane to support the mainsail boom with a new, heavier topping lift.

With the spinnaker pole supported at the end, it now must be guyed in position. Fore-and-aft loads are light, so the guys can be quite small. Position the pole as close to right angles to the hull as possible. The closer to 90-degrees you are, the further out flopper-stopper will be, and the better the resultant counterforce.

If the main boom is used, the mainsail will be rubbing against the lower shrouds. When you plan to be rigged out for more than a day, some form of chafing gear is advisable.

A pennant will then be required from the flopper-stopper to the end of the boom. Once again, this needs to be strong. We've usually used a piece of 3/8-inch (9.6 millimeter) or 7/16-inch (11 millimeter) braided Dacron. The

Help

Sundeer in Hanalei. Two flopper-stoppers and a mizzen are required to keep us stable in the 3-to 4-foot (0.9- to 1.2-meter) beam swells.

pennant should be just long enough so that at the extreme portion of an up-roll the flopper-stopper is still a couple of feet (600 millimeters) below the surface.

When the time comes to deploy the unit, it is usually best to drop the flopper-stopper over the side with the boom close aboard. The boom is then pulled into position, flopper-stopper trailing.

If you're reading this in a rolly anchorage, and don't have a commercial source of flopper-stoppers, don't despair. There are several other approaches that will, with some experimentation, work well.

Using a Bucket

Remember that the principle in use is a counter-force to that which is wave-induced. You can achieve the same sort of results with a large bucket filled with water (at least 5 gallons/20 liters), which is suspended from the end of a boom, with the edge of the bucket at water level when the boat is on an even keel. As the bucket is lifted clear of the water by the boat's motion, its full weight is carried by the boom. When the boat rolls back, the bucket's weight is carried by the sea's buoyancy, reducing the load on the boom. This isn't as effective as a valved unit, but on smaller boats, or in a pinch, it can work quite well.

While not as effective as a dedicated flopper-stopper, a bucket will help. If you cut large holes in the bottom, and then create a flap valve from rubber or heavy sail cloth, it will work even better.

Sailbags

Another approach, adopting the same principle, is to utilize a submerged sailbag which is not porous (or lined with a large, plastic garbage bag). We've even seen folks using small dinghies. However, take care with dinghies and sailbags not to make the load too great.

Help

Air Stabilizers

You can substantially diminish the roll on a ketch or a yawl, by leaving the mizzen hoisted, sheeted in hard.

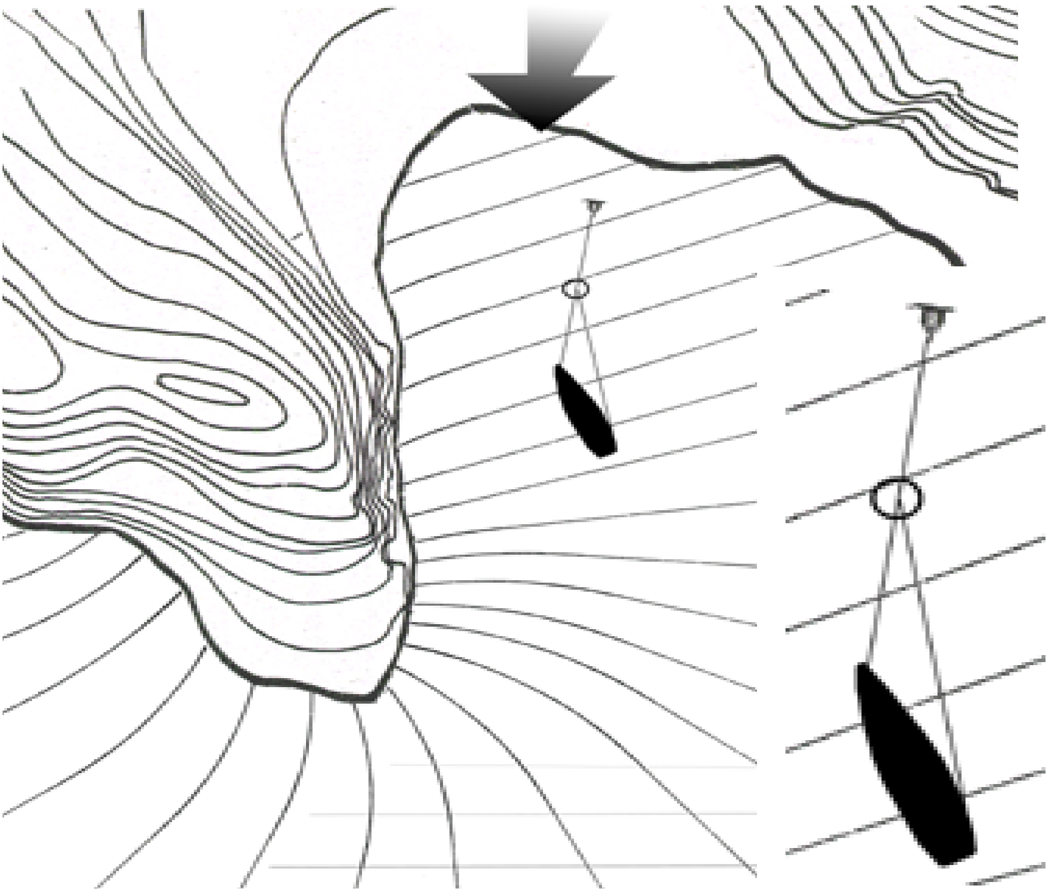
We met our biggest challenge to roll control on the north shore of Kauai in the Hawaiian Islands. Hanalei Bay, while providing wind protection, allows a substantial northeast tradewind swell to wrap into the anchorage. It was not uncommon to see boats rolling 20-degrees in either direction on windy days!

Aboard *Sundeer* we were forced to go to two flopper-stoppers as well as a reefed mizzen. But even when the swell reached 3 to 4 feet (0.9 to 1.2 meters), we were nice and comfortable.

Anchor Rode Bridles

Sometimes just a modest change in heading is enough to get the boat to lie quietly. If there is a steady breeze blowing, you can sometimes accomplish this by bridling the anchor rode between bow and stern. Using a snatch block on the rode, or a tieing off a control line to the chain, and then running this to a headsail block at the back of the boat, you can crank the stern into the wind.

The bridled anchor system shown below is useful in aligning the boat with a swell sweeping into an anchorage. Depending on the boat, and wind/wave relationship, the boat can be moved as much as 60-degrees off the natural alignment with the prevailing wind.



Help

Leaving the Boat

I don't know about you, but whenever we are away from one of our boats we're just a little bit nervous. This is especially true when we are sailing uninsured (which is most of the time). It doesn't seem to make a difference if the boat is tied in a marina or on the hook. We are always glad to get back aboard and find everything okay.

As a result of this nervousness, and after seeing problems cruising friends have had from time to time, we've adopted certain simple procedures when we leave.

Short Trips Ashore

Check list for leaving the boat:

- ❏ Turn off pressure water pump.
- ❏ Check bilge pumps.
- ❏ Close seacocks.
- ❏ Turn on anchor light.
- ❏ Turn off windlass circuit breaker.
- ❏ Make sure chain stopper and/or gypsy dog are engaged.
- ❏ If using rope rode, review chafe protection.

When we are gone for a short period (less than a day) we take a few simple precautions to reduce the odds of anything going wrong. First, the pressure water pump is turned off, so a break in the pressure plumbing system won't cause a mess in the boat. Next, the windlass circuit breaker is turned off, so there is no chance for the windlass switch to short and raise the anchor.

Next, we close the seacocks.

Keep in mind that if your cockpit drains empty below the waterline (a bad idea—it is better for them to empty through the transom) you may not want to shut these seacocks if heavy rains are a possibility. Otherwise, the cockpit may fill and flood down below through the washboards or cockpit seat lockers.

If we have any automatic systems aboard, such as an electric head or an inverter, these are turned off. Next, we give the manual override switches on each bilge pump a flip to make sure the pumps are working. The masthead anchor light is turned on if we expect to be returning after dark.

Finally, one of us checks the windlass to make sure the chain stopper is engaged, as well as the gypsy pawl.

This sounds like a long list, but in reality it takes less than five minutes to do everything, and we are much more comfortable while we are away than would otherwise be the case.

A Few Days Away

As the time period lengthens, my concern goes to unexpected weather and what that means for our anchorage or docklines. We try to think about the worst that could happen, and then allow for it in the mooring system.

Since we use a storm-sized anchor on a standard basis, we rarely worry about dragging.

However, some of our friends with more modest anchors will set a second hook, or (our favorite) two anchors in line on a single chain.

In the rare event that we are tied to a marina, we'll double up on the docklines, making sure in the process that the cleats to which we are secured on the dock are throughbolted and secure.

If you are living aboard, the odds are you will have a fridge that needs

Help

some engine time or makes it necessary to charge the batteries. In many cases you can deal with this with a few solar panels (most fridge systems have their power consumption cut in half if they are not opened during the day).

The solar panels eliminate the need to run the engine every couple of days, which simplifies the task for whomever is to look after the boat while you are gone.

If we do need to have someone come aboard to run the engine, we have found that the best system is a written set of instructions, a check list of things to do when the helper leaves the boat and large tags placed on each valve and switch that must be dealt with.

Long Term

Once the period away stretches to a month or more, we take even more precautions. We evaluate how secure the anchorage is in a really strong weather event. How safe will the boat be if there are hurricane-force winds?

We prefer an anchorage that has minimal fetch so seas can't build up. Current and tidal range need to be reviewed, and we will want to be sure that dangers from other vessels are minimal.

If there are prevailing gale force winds from one direction, we try to pick a spot that has minimal fetch in that direction, and perhaps some form of a wind break from shore features.

If the anchorage of choice is located along a river, we check on the propensity for flooding (20 years ago the Keri Keri river in New Zealand flooded, washing out several dozen attended and unattended boats in the process).

Roller-furled headsails are dropped, bricked, and stowed below.

Sail covers are wrapped with light line to keep them in place if it really starts to howl.

We make sure that docklines have heavy chafing gear (vinyl reinforced hose slipped over the dockline works wonders), and that spare lines are easily accessible to whomever is watching the boat for us.

If the fridge is loaded, it may be easier to give away the food rather than deal with someone having to keep the batteries charged.

We also check all the floorboards and lockers, and lift bunk mattresses to promote air flow while the boat is closed up.

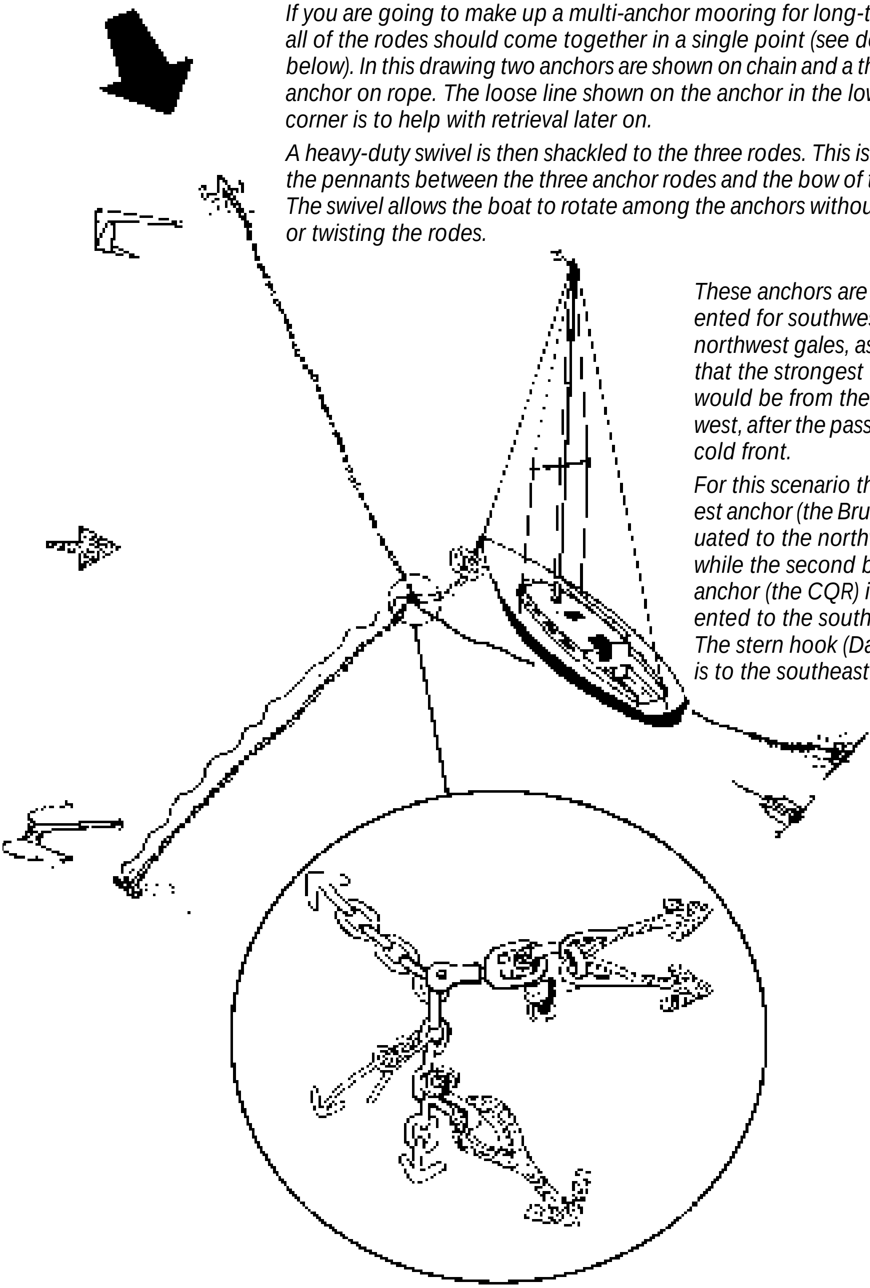
Making Up a Mooring

Our own choice is to lie to a single rode, perhaps with double anchors as already discussed. However, in some areas multi-anchor systems are a requirement due to nearby vessels and lack of swinging room.

In this case the ideal situation is to have three anchors set, coming together in a single point mooring. This means that you always have the wind pulling almost directly back on one of the anchors—or if not, at least the angle between the two closest anchors is not that great.

This calls for an anchor swivel which should be rated at one-and-a-half times the breaking strength of the chain.

As the security of your vessel depends on this swivel, don't take the seller's word for the breaking strength. Get the part number, and then check with the manufacturer.



If you are going to make up a multi-anchor mooring for long-term use, all of the rodes should come together in a single point (see detail below). In this drawing two anchors are shown on chain and a third stern anchor on rope. The loose line shown on the anchor in the lower left corner is to help with retrieval later on.

A heavy-duty swivel is then shackled to the three rodes. This is used for the pennants between the three anchor rodes and the bow of the boat. The swivel allows the boat to rotate among the anchors without fouling or twisting the rodes.

These anchors are oriented for southwest-to-northwest gales, assuming that the strongest winds would be from the northwest, after the passage of a cold front.

For this scenario the heaviest anchor (the Bruce) is situated to the northwest, while the second bow anchor (the CQR) is oriented to the southwest. The stern hook (Danforth) is to the southeast.

Choosing a Marina

When we leave our boats in marinas for long-term storage our main concern is theft. Towards this end, we evaluate the security of gates, waterborne approaches, and whether guards are available. Our preference is to be in marinas where there are liveaboards, as these friendly folks tend to keep an eye out for one another and seem to keep thieves at bay.

The docking system itself may vary from marina to marina. This is especially true where surge or a large tidal range is an issue. I like to be aboard through a spring tide, so that we see the tidal range at its most extreme.

If the boats around us have special tie-off systems—perhaps springs or snubbers are in use—we will try to find out the logic behind these systems. Sometimes there is a good reason; at others it is just habit because everybody seems to do it for no particular reason.

Another issue with marinas can be electrolysis. If you are not using shore power, this will not be an issue. But if you are connected to the shore grid, it is best to use an isolation transformer, which keeps your ground system separated from that of the shore power system. (For more data on this see *Offshore Cruising Encyclopedia* page 889).

If you are connected to shore power, it is usually better to keep your distance from large yachts with big electrical systems, especially older boats made of steel. If they have an electrolysis problem aboard, and you are both connected to the same power grid with a common ground, you may end up sharing their difficulties. However, when using an isolation transformer this will not be an issue.

Dry storage is usually the most secure way to leave a boat. You don't have to worry about chafe on docklines or electrolysis. However, flooding, and boats tipping over from earthquakes or severe wind storms are a risk.

Caretakers

It is common throughout the cruising community for friends to watch each other's yachts as one family or another journeys home or inland. This is fine for short periods, but we feel that it is better to have a professional relationship with the caretaker if the period away from the boat is going to be long-term.

Aside from checking on chafe, and airing and washing the boat on a periodic basis, we feel more comfortable if the caretaker has the experience and initiative to deal with any minor problems that may arise.

Some cruisers choose to fly out sailors from home to stay on their boats when they are away. In some ways, this makes the best sense. The boatsitter (this could be a local cruiser too) cannot only take care of the boat and reduce the potential for theft, but he/she can keep an eye on the anchorage and make sure no one anchors too close or fouls the ground tackle.

Retrieving the Anchor

In light to moderate conditions picking up the anchor is a straightforward proposition. You will generally want to use the engine just a bit to reduce windlass load.

Once you are over the anchor, if the hook is well dug in, you may want to sit for a couple of minutes with the rode straight up and down. This is usually enough to gradually break the anchor free from the sea bed.

If the anchor is really buried, you may need to use a little power ahead to trip the anchor free. When this is the case, make sure that the rode is as tight as possible before going ahead. This will reduce the angle aft on the rode, and reduce the chances of scratching the topsides

In a Blow

Retrieving an anchor in a strong wind takes coordination and practice. You need to use the engine to come up on the rode. But you do not want to override the rode and then have the bow blow off.

Thus, the person on the helm will have to follow the directions of the bowman, probably using a system of hand signals (see page 180), as verbal communication will be difficult if not impossible if it is very windy.

Powering Up

The actual technique you employ varies with conditions. If a sea is running and there's a great deal of wind, the helmsman will have to power ahead slowly, no faster than the chain is coming aboard, which often means interspersing short periods of power with neutral.

He or she will have to follow the lead of the rode, that is, keep the bow lined up with the direction of the pull. Since the wind and waves will be trying to push the bow one way or the other, the utmost concentration is mandatory.

When the correct action on the engine is in doubt, back off on the power and let the boat settle back on the rode. Then, once the situation is stable, begin to move ahead slowly again.

If the anchor is really dug in hard the engine can be used to break it free. Bring the chain in tight, and then power slowly ahead. Keep an eye on the chain and make sure the chain doesn't rub against the hull (or it will take off the bottom paint). If a sea is running take care with the loads on the windlass. The shock load of the waves raising the bow and powering ahead are liable to damage he windlass unless a chain stopper is used.

Before we leave this section on anchoring a word is in order on electric windlasses. This is one of the most important pieces of safety gear you can have aboard.

With a powered windlass there will be less hesitation to pick up the anchor if the set isn't just right, and you'll be more likely to leave at the first hint of trouble.

A powered windlass makes it easier to kedge yourself out of trouble and to go aloft.

Using electric windlasses:

- ❏ Keep voltage high by running engine for 10 to 15 minutes before hoisting to charge batteries.
- ❏ Use windlass in short bursts (which allows the electric motor to stay cool).
- ❏ In a breeze use the engine to relieve strain powering slowly ahead.
- ❏ Have a chain lock to take any surging load off the windlass.
- ❏ Keep windlass clutch lubricated.The clutch is designed to slip if the windlass becomes overloaded, preventing damage to the gear box.

Help

Winching

If there is a sea running, the bowman winches the rode home when the bow *drops* on the waves. This applies to using a power winch or cranking the rode in by hand. When the boat is lifting to a sea, you want to dog off the clutch. When the anchor is close to being broken out, you must be careful not to overload the system as the bow lifts to waves as the shock loads can be extremely high.

If you are concerned with a fouled or an extremely well-dug-in anchor, you may want to ease the rode out a little as the bow lifts, to reduce shock loading. (Most anchor chain failures occur when the chain is almost vertical, with the bow trying to lift to a swell.) The load at this point will be much greater than with an angled pull.

Once the anchor is aboard be sure to lash it in place. Don't rely on the chain gypsy or primary rode to hold it. At sea over a period of time the anchor can loosen itself, and if it does, it can do an enormous amount of damage.

Fouled Anchors

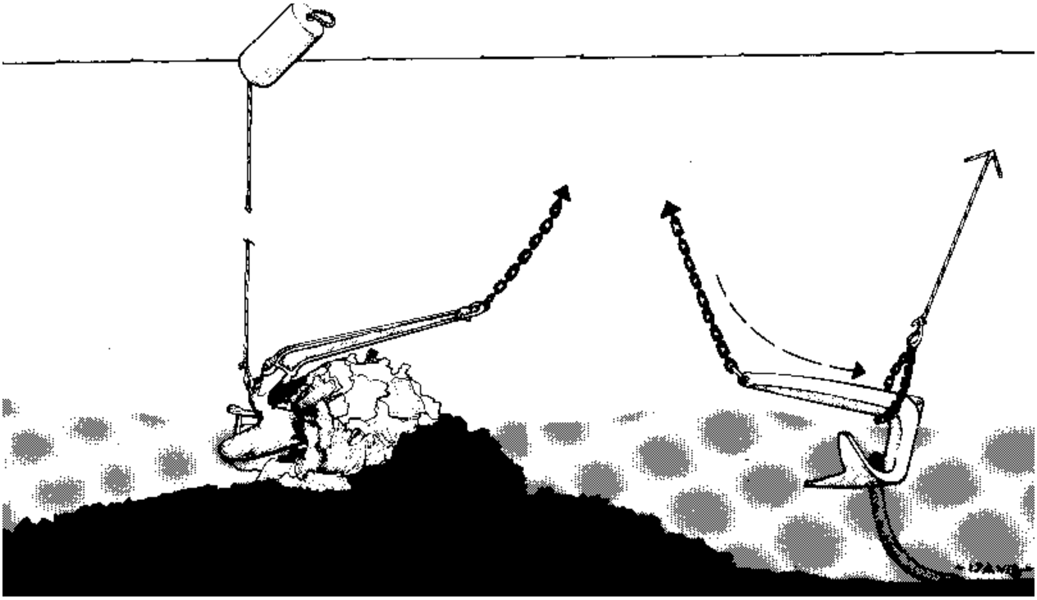
If you have a foul, the first thing to do is to determine if the problem is with the rode or the anchor.

Coral Fouls

Frequently it will be the chain which fouls rather than the anchor if you are in an area with lots of heads on the bottom. The fouls may be light, just a corner or branch or a head. In this case you can frequently bring the chain up short and allow the sawing action of the chain on the coral to break off the obstruction. On the other hand, if the rode is caught on a really large coralhead or rock, you may have to unwind it using the engine to maneuver.

Two approaches to freeing a fouled anchor are shown below. If you have a tripping line (left) it is a simple matter to back the anchor off whatever is fouling it—which is why trip lines are such a good idea in foul anchorages.

On the other hand,. it is often possible to slip a weighted loop down the rode, and then pull it forward on the anchor stock (right) and use this to free the anchor. Obviously it is necessary to know what direction to pull the loop, which means water clear enough to see the anchor in is required. If you are patient and methodical, however, this can be made to work without seeing the anchor.



Help

Alaska is one of those places with rock and boulder strewn bottoms, and although we carried a 3/8-inch (10-millimeter) thick wet suit just in case, nobody aboard had the desire to test its insulation qualities in water which had icebergs floating nearby!

This series of photos shows a large boulder which we picked up on our 176-pound (80-kilogram) Bruce anchor. In the second the third photos you can see how the trip line works at the surface. The line is tied off to the bow roller and as the chain is eased the anchor capsizes, freeing the boulder.

Note: any time the anchor is fouled by a piece of loose material like this, the holding power is basically lost. The only way to check is by backing down under power. If the anchor holds under load, it is probably dug in and not fouled with something caught in the flukes.

This unwinding procedure usually requires a methodical series of attempts. Ideally someone will take a swim and check out what is wrong, so you know what is required to get free.

However, if this is not possible, and you are doing the job blind, keep a close eye on the manner in which you approach the situation because your first attempts may make the situation worse, and you will have to unwind these before you can deal with the real culprit.

While a fouled chain will usually saw its way through whatever is holding it, a fouled anchor may have too much surface area, and may require changing the angle of pull with the engine to dislodge it from whatever it is stuck on. Or, you may be able to trip the anchor free.

Tripping the Anchor Free

Anchors that are hooked onto obstructions, such as pipes or wire, can often be freed by sliding the weighted loop of another rope down the rode and onto the shank of the anchor. This loop is then pulled tight about the *head* of the anchor and the rope is winched home. By easing off the rode the anchor is upset, and the tripping rope wrenches the anchor free of the offending obstruction. CQRs and Bruces are particularly amenable to being freed by this procedure.

Many anchors, such as the Bruce and CQR have "tripping eyes" on the head of the anchor. If you dive on the anchor and connect a trip line (or attach a line here before you anchor) winching from this point will tilt the anchor off of the obstruction to which it is attached.

Coral can also foul the flukes. We caught these chunks on Beowulf's 240-pound (110-kilogram) Bruce anchor at Raivavae in the Austral Islands at the edge of the tropical South Pacific.

When we first started to set the hook it dragged, We worked with the anchor on the bottom for awhile, and then picked the anchor up to find a better spot to re-set it. We did not, however, check the anchor itself (it was hanging over the bow).

After two more unsuccessful attempts to get the anchor to hold we were thinking it was just a lousy bottom. Then we decided to check the anchor and "voila", the coral.

We rigged a trip line (bottom photo) and then eased the anchor back out (not shown) so it would capsize and dump the coral.

On our next try with anchoring we got a good bite right off the bat.

There are occasions when you'll pick up a mooring cable, engine block, or large boulder on the anchor. If you raise this to the surface the tripping line can be attached from the dinghy. With the tripping line secured simply ease the rode off the windlass and the anchor will swap ends dropping whatever it is hooked to.

Diving On the Anchor

Diving is the best means of clearing fouled anchors and chains if the water temperature and clarity allow. Even if the hook is too deep for you to dive to it, a quick snorkel may enable you to see the cause of the problem.

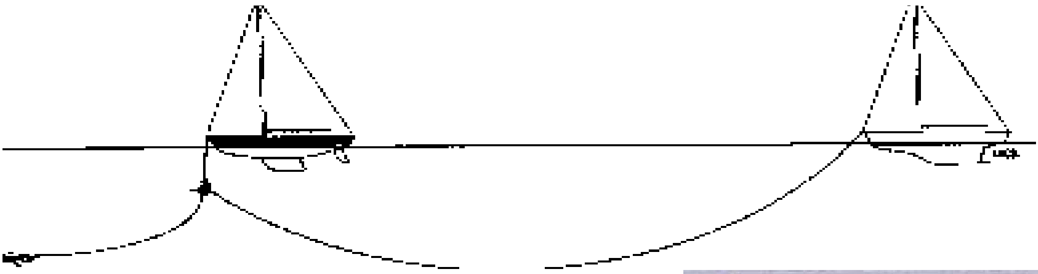
We feel scuba gear and the knowledge of its safe use are essential ingredients of seamanlike anchoring. However, it may not always be practical to carry scuba gear. A simpler alternative is a "hooka" set up, where a small, oilless compressor is used to provide air to a small mouth piece. You can typically dive to 50 feet (15 meters) or so with this type of system, and it is actually easier to use for cleaning the bottom than scuba gear.

Warning: even diving at shallow depths you can seriously damage your lungs with scuba gear or a hooka system. It is best to take a dive course and learn the proper way of using this gear before going cruising.

Even the pros get fouled, especially when anchoring stern to in crowded harbors! Top photos Katana, the 240-foot (73.6-meter) "tender" to Larry Ellison's all-winning Maxi Sayonara. Another motor yacht has laid its bow anchor over theirs, and now they are trying to untangle the mess. The arrows in the left bottom photo show the other vessel's chain, wrapped around Katana's.

They spent the better part of an hour working their own chain up until they could get their anchor to the surface (holding position with bow and stern thrusters in the wind with a bunch of boats anchored just to leeward).

Once the anchor was at the surface (right lower photo) it was possible to get a line around the offending chain, take a load on it, and then maneuver their multi-ton anchor out of the way. All done very professionally with a lack of shouting or excitement.



Diving in Murky Waters

The time may come when you are irretrievably connected to the bottom, you don't want to slip the anchor and come back and free it later, and the water is so murky you can't see six inches (150 millimeters) in front of your mask.

We faced just such a dilemma when we were ready to leave Pago Pago years ago. The harbor was filthy with runoff from the fish processing plants and local sewage. The water was totally opaque, and after three hours of weaving back and forth under power I had to admit that either someone was going to have to go for a swim, or we would be leaving our main anchor and half our chain behind as a souvenir.

Even though the water was quite warm I put on a wetsuit, gloves, booties, and hood. I was looking for as much protection from whatever was down there as I could get!

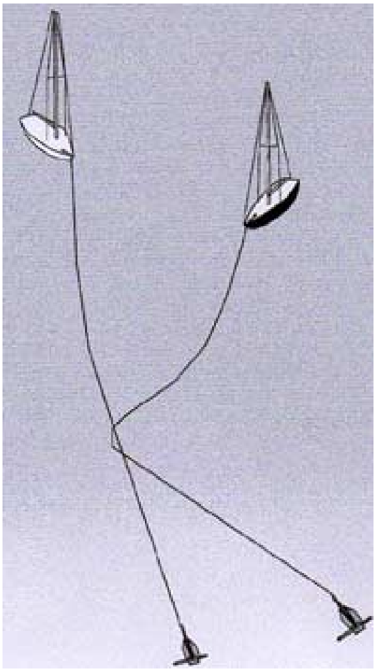
With my scuba gear bubbling away I used the chain itself as a guide to the bottom, pulling myself down hand over hand.

Once on the bottom, it was a question of working along the chain, then finding an obstruction, then working as little farther down the chain.

After I thought I had the first segment figured out I tied a reference line to it and surfaced to tell Sarah and Elyse what their Mom needed to do with the engine and rudder. Linda would respond, and then down I would go again to check the results. This laborious process went on for four hours before we finally were able to hoist our CQR back aboard.

We then moved the boat closer to the harbor entrance, where there was a sandy spot (recently vacated by another cruiser) in which to drop our hook.

That evening, celebrating our conquest of the bottom in a local restaurant the subject turned to sharks and I came to find out that the reason the locals tended not to swim in the harbor was out of respect for the resident population of hammerhead sharks—who were known to be very aggressive! Needless to say, had I known this before I dove on our foul I think I would have stayed on board, cut the chain, and/ordered a new anchor.



Here is a simpler method than Katana used for uncrossing fouled rodes.

The two yachts need to raft together or the after vessel (as shown here) assumes the active, maneuvering role.

The aft boat powers slowly ahead to relieve the strain on the rode, while the forward vessel winches her anchor home. One the anchor is at the surface, a line can be taken around the other rode to unload it, and the anchor freed.

This is not a process which works well in adverse weather.

If you need to exit in a hurry, it is better to buoy and then clip the anchor (and come back for it later).

Hurricane at Anchor

"Starboard 10 degrees," comes the call from Linda, standing on *Intermezzo*'s lower spreaders. "Hold her steady right there. It looks like we'll have room to swing just around the point off to port." We were threading our way through one of the fjord-like channels of Papua New Guinea's Cape Nelson region.

Tucked deep into the Cape Nelson area of Papua New Guinea, Intermezzo is anchored in with a spectacular back drop. The cliffs raise straight up on three sides, with only the head of the anchorage, where a valley floor slopes to the water, being accessible.

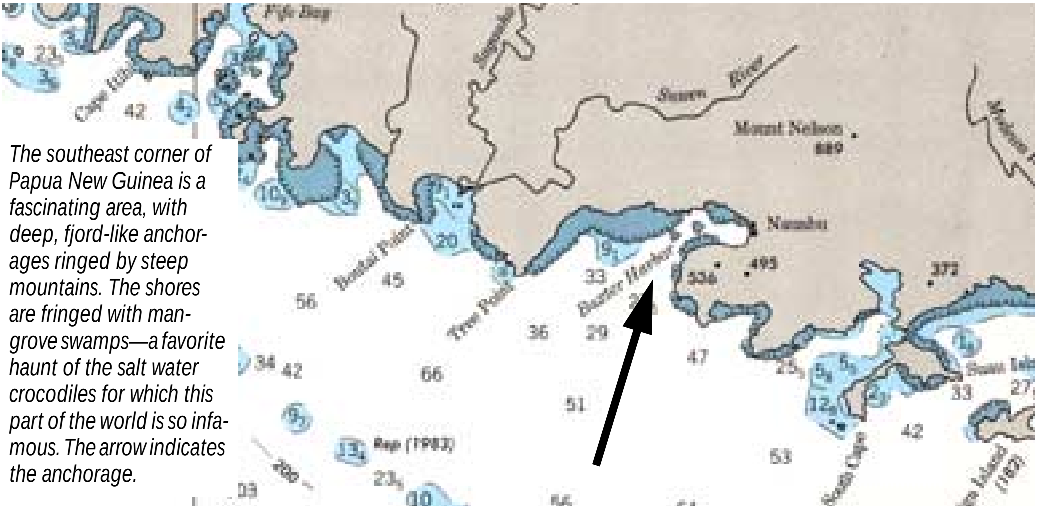
For the past six weeks in company with the Schmidts aboard *Win'Son* we have been exploring this rarely visited part of the world. We have been rewarded with both beautiful deserted anchorages and visits from primitive but friendly villagers. But now both crews are restless and looking forward to the big city, Port Moresby, a few hundred miles away, just around the corner. It is the end of April, the "official" hurricane season is about to close, and we are ready to move out of the "safe" area towards one frequented by typhoons in the Southern Hemisphere summer.

Although our cruising ground is exotic, the seasonal migration we are effecting is typical of that of cruising yachts all over the world. Most choose to travel to new areas outside of the hurricane belts during the summer. In the West Indies, people head for the Mediterranean or the eastern seaboard of the United States. South Pacific cruisers usually head for New Zealand. A few hardy souls stay in the tropics but spend much of their time anxiously listening to forecasts and keeping a weather eye on the local hurricane hole as they enjoy deserted anchorages.

As we make our turn to port a large cul-de-sac opens ahead; several deep-water streams emptying into the anchorage give promise of tasty mangrove oysters. We might even see one of the saltwater crocodiles for which this part of Papua New Guinea is famous.

The steep-sided channel is flanked by craggy cliffs and steep hills. Once inside we are confronted by a vast flat bowl with the cliffs receding into the background. As we look around, an eerie feeling overtakes us all.

Help



The southeast corner of Papua New Guinea is a fascinating area, with deep, fjord-like anchorages ringed by steep mountains. The shores are fringed with mangrove swamps—a favorite haunt of the salt water crocodiles for which this part of the world is so infamous. The arrow indicates the anchorage.

Something isn't right.

The lush jungle foliage of the entrance channel has given way to a semi-barren, contorted landscape. Instead of huge, brilliantly green trees draped with vines, we see broken and twisted stumps, uprooted giants thrown about at crazy angles. It looks like the set for a Grade B jungle horror movie.

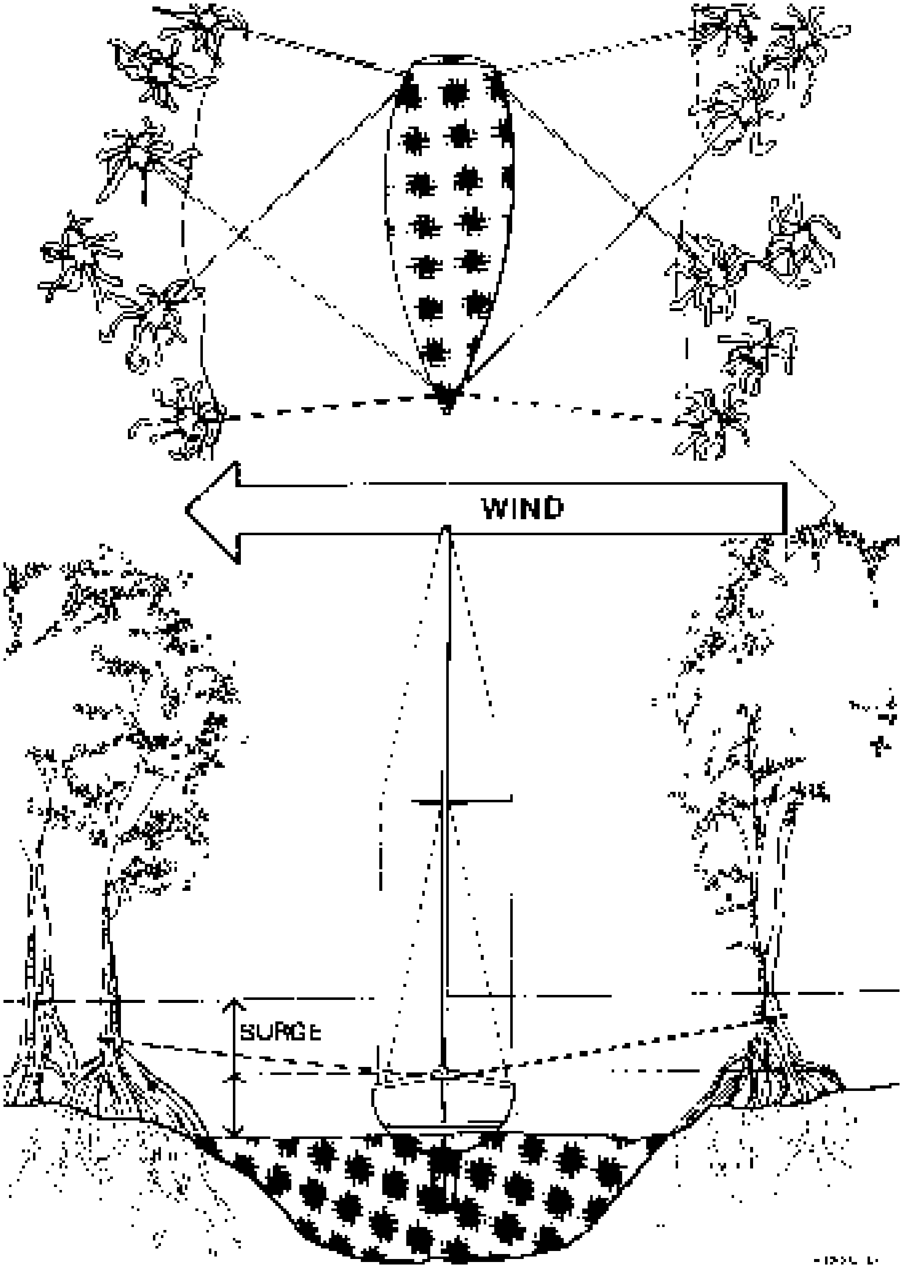
We drop the hook, get a good bite under power, and launch the dinghy. A short ride brings us to a landing, where we can scramble ashore and head for the local trading post. Linda is after some fresh bread, and I am hoping for a few tall tales. We are frankly curious. What we learn generates more unease than any horror story.

Two years previously there had been a 180-knot cyclone blow through the anchorage. Not only is this area considered outside the typical hurricane belt but that storm had occurred in June, well outside the Southern Hemisphere summer season. The storm had devastated the local crops, forests, and villages. The tale brings home most forcefully the fact that *hurricanes can happen almost anywhere, at any time of the year.*

The message is clear: never take for granted that you are fully safe from a major tropical storm. Of course, properly prepared, with a well-found yacht, in a secure anchorage, you can ride out a revolving storm with a minimum of trauma. The key is preparation and having the right gear aboard.

The best tropical protection from hurricanes will be found in the mangrove swamps, usually up a river or estuary. The trees deflect the wind above the surface, and their roots provide strong points from which the boat can be bridled. It is best to strip the boat of roller-furling sails, covers, and halyards, to reduce windage as much as possible.

Help



The ideal situation in the mangroves is to bridle yourself between the edges of the river. Lines should be doubled up and heavily chafe protected. If you have short lengths of chain, use these to connect to the mangrove roots or around tree trunks to avoid chafe on the lines.

Allowance has to be made for storm surge. Try to get as many lines as possible led to winches before cleats. If you have to adjust during the height of the storm, it will be much easier to ease or tighten, if you are working with a winch rather than just a cleat.

And then once you are secure, sit back, relax, and try to stay cool. The odds are the storm will pass you by, if you are prepared.

Where Do You Shelter?

If a tropical storm is imminent, your first decision is where to shelter. Consider the expected direction of the wind and any shifts, the height of water from flooding or storm surge, damage from flying debris, the number of other vessels in your anchorage, and the protection from wind and sea afforded by the surroundings.

When summer cruising where the possibility of a storm is present, it is always best to stay close to a "hurricane hole" and to have alternative harbors in mind in case traffic or weather makes getting to your first choice impractical.

Your best bet is to go up a river or creek or into a mangrove swamp. The close foliage will act as a windbreak and in many cases cause the worst of the storm to pass overhead. Second, there will be plenty of ways to tie the boat. Mangrove swamps are usually narrow enough for you to center the boat between the banks, tying off to the mangrove roots.

Securing the Boat

Where each line you put out passes around a tree, lamppost, or even cleat (be sure the cleat is well secured), chafing gear must be employed. On board chafe must be watched as well. Chafe is more severe in one of these blows because the wind is unsteady, causing the nylon to stretch and contract. Any corners or rough surfaces will abrade it rapidly.

When things don't go right: these boats all dragged ashore during one of the many West Indian hurricanes. However, for the most part they can be salvaged because no other boats landed on top of them. It is typically a case of pulling the boat off into deep water, and maybe do some rudder and keel repair.

If you are going to be in hurricane-prone areas, it pays to have substantial ground tackle.

Tim Wright

Help

These boats are all salvageable, once again as they've landed by themselves (although the rocky beach (above) and concrete sea wall (below) are less hospitable than a nicely sloped sand/or mud beach.

Note how the rudder of the bottom boat has lost the tip—which is good—rather than damage the entire rudder shaft.

Tim Wright

Anchoring Considerations

If your only options are anchorages, look first at the amount of protection from the expected direction of the storm winds. Secondly, consider what you will do once the eye passes and the wind goes through its major shift. Normally you move to the next windward shore during the lull before the storm resumes. Is there sufficient protection there? (It is also important to know the lay of the anchorage so you can make the change in less than ideal light if necessary.)

Think about the bottom characteristics. Only the best holding will suffice in a true storm: hard mud or deep sand. We always checked holding by reversing at full throttle against a medium-sized anchor. If it holds, we are sure our big hooks will do well in the blow.

If it's likely that you'll have to share the anchorage with other boats, commercial or pleasure, it is important that you be in the best spot early. That may mean moving before an actual alert is given that danger is imminent. In many parts of the world the biggest risk in a blow is from other boats dragging or breaking free in crowded anchorages.

Many times a storm will be in your general region but too far away to cause damage. It may even be heading away from you. This can create a false sense of security. If it changes direction suddenly, within hours the clouds and rain that are usually on the fringes of a storm may make it impossible for you to move to your protected spot.

In storm conditions you should lay out two or three hooks. The main hook on chain should be left slack so that it only takes load when the rope rodes have stretched to their limit. Chafe at the stemhead must be watched carefully.

If the option exists, try to orient your boat's bow towards the expected worst direction of the wind. Remember that in gusts she may be heeling, perhaps almost on her beam ends. Is there room for your mast to clear other vessels or trees?

It takes lots of line to do a good job. Most experienced cruisers carry enormous quantities in the unlikely event they will need it. Aboard *Intermezzo II*

Help

This is so depressing we didn't want to use it in the book. But then we thought, "Hey, there's a good lesson here."

If you compare the landing place of this unfortunate vessel to the others you will see she had the misfortune of fetching up against a small rock cliff. With the waves slamming the boat against an immovable object like that, there isn't a hope, even with a metal boat.

Which brings us to the lesson: A major consideration for positioning the boat in a hurricane anchorage is what is the land like onto which the boat is likely to drag. Obviously it is better to look for a soft landing spot.

we had a total of 1,200 feet of 3/4-inch nylon and 800 feet of 5/8-inch nylon for use as either rodes or securing lines. If we had been caught in a hurricane, you can bet every foot would have been used.

On-Deck Preparation

Sails on booms, roller-furled canvas, even halyards, should be brought belowdecks to reduce windage and the chance of something getting free and causing damage. All hatches should be dogged and storm covers fitted. Dorades should be removed, and cockpit lockers sealed shut. Deck and cockpit drains must be clear and free running. More than one yacht has been sunk by *rain* in a tropical storm. If you expect flying debris, your storm shutters should be rigged.

After the storm hits, take bearings to ensure that you aren't dragging, and maintain a careful eye on the storm surge and flooding. If you are tied close to a dock or trees, the water's rise and fall will make line adjustment necessary.

Yachts in cyclone-prone areas such as Fiji and Guam have ridden out 200-plus-knot storms. The key is being prepared in advance and taking action to find shelter while our choice of adequate hurricane holes is best.

Being aboard a multihull at anchor during a hurricane raises a different set of issues. The basic problem that these designs inherently have a huge amount of windage in their structure, allow the wind to get underneath the bridge deck area, and are light in weight. The potential is there to get upside down (as shown in the photo below).

While conditions will vary between boats and with storm and wave development, there are several things to consider:

- ❏ Make sure the boat can maintain an into-the-wind attitude.
- ❏ Being tied to a dock, on only one side is riskier than it is with a monohull.
- ❏ Consider flooding the hulls to provide more stability.
- ❏ Can breast anchors or tie downs be set if the boat cannot weathercock? These may help prevent capsize.
- ❏ It may be safer ashore than aboard.

Liggett

Help

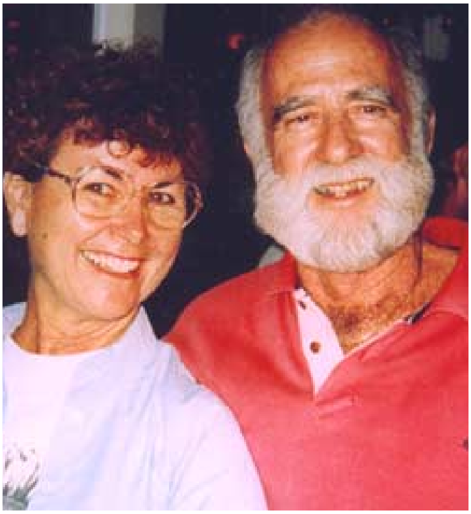
Al & Beth Liggett

Al and Beth Liggett have been cruising for the better part of the last three decades. With a couple of circumnavigations under their keel, and experience on virtually every ocean of the world you would expect them to have good data on just about any subject to do with cruising.

We first met in the Solomon Islands more than twenty years ago—we were aboard *Intermezzo* and they were aboard their brand new 42-foot (12.9-meter) cutter *Sunflower.* We spent time cruising together in some pretty remote places, then lost touch as they headed north towards Guam, Japan, and eventually the Pacific Northwest coast of the US while we continued on our trip across the Indian Ocean.

We met up again in Puerta Vallarta in the early 1980s. They were still aboard their lovely *Sunflower*, while we were aboard our new *Intermezzo II*.

In the ensuing years we've stayed in touch by ham patch, letters, and e-mail and all too brief get-togethers every four or five years.



Al Liggett

So you can imagine how pleased we were to get a phone call from Al and Beth announcing they were visiting in the states for a few months.

Being in the middle of writing this section on hurricanes we couldn't resist asking them their thoughts on the subject. As off and on again residents of Guam for many years, they were bound to have a lot to say on the subject.

Guam

Guam has the distinction of lying in one of the most active tropical disturbance areas in the world. It has been hit by some of the largest and strongest storms (called typhoons in that part of the world) on record.

And these storms can hit at any time of year, not just during the summer.

Agana Harbor, the main port for Guam, is a relatively open location—not the type of place you would want to be in a category five storm.

But the Guamanians have dredged out a harbor of refuge. On the bottom of this refuge is a grid of eight ton concrete blocks. These blocks have a rebar (reenforcing steel) U-bolt in each corner and another in the middle, with a piece of half-inch (12.6-millimeter) chain running under the center to each corner.

To the center U-bolt is attached a two-inch (50-millimeter) diameter hauser, with a float about half way up from the bottom and a second float on the surface. There's a large loop spliced into the end of this hauser.

The blocks are set in a grid, approximately 30-feet (9-meters) on center in one direction and roughly 70-feet(21-meters) on center in other.

Help

When a typhoon alert is sounded all of the yachts move into the harbor of refuge and begin to secure themselves within the grid.

With 50 boats typically tied up in this close fashion, you obviously want to make sure that you *and* your neighbors are well secured.

The Agana harbor of refuge has been carved out of coral, and is entered by a narrow channel. The arrangement is such that there is no room for waves to build. Wind, and your neighbor's staying in place are the only hazards.

Cat's Cradle

Sunflower is a flush deck design, with just a small house over the galley/nav area ahead of the cockpit. In order to develop headroom below (of which she has plenty) she has a lot of freeboard, so the wind loads she experiences from all of her windage are going to be more like a 50-foot (15-meter) vessel.

We'll let Al pick up the explanation from here:

We use a mixture of 5/8-inch and 3/4-inch (15-millimeter and 19-millimeter) three-strand nylon line. This is shackled directly to the corners of each of the four cement blocks with one-inch (24-millimeter) shackles.

We use lines port and starboard fore and aft. And, there are two sets of lines at each point. The lines come aboard through very large open chocks—they are 8 inches (200 millimeters) on the base—and these are secured to 14-inch (350-millimeter) cleats at the bow and stern.

"In addition, we have a pair of spring line cleats mounted amidships. We take fore and aft spring lines from the center pennants on the mooring blocks. This gives us a total of 12 lines holding us in place.

Before the storm, Sunflower with a variety of bow, stern and breast lines (she's in the lower right-hand corner).

Line Adjustment

When we first tie up we adjust the pairs of lines on the four corners so there is plenty of slack to allow for storm surge which can reach a couple of feet (600 millimeters). You don't want these mooring lines sinking the boat!

With each pair we leave a little extra slack in the second line. This way the first line takes up the load and stretches a bit, before the second starts to work. This gives us a better shock absorber effect in the gusts. The spring lines are left slack enough so don't they begin to take up the load until the boat heels to gusts from the beam.

Chafe Protection

For chafing gear we've found that best material is the nylon-reinforced tarp material which you can buy in the hardware store for five or ten bucks. We tear this into wide strips, and then wrap it around the line ten times or so. This tarp material is held in place by duct tape.

We were really surprised to hear that Al and Beth didn't use nylon reinforced vinyl hose and asked why:

The tarp material is really slippery, and it moves with the lines when they stretch and contract under load. When you use the hose, it doesn't move. The line moves inside the hose rather than with it and with the high loads we get, the hose quickly wears through.

Help

Winds of up to 125 knots during Typhoon Omar. The eye of the storm passed right over Guam.

Adjusting under Load

You have to adjust the lines during the storm so they are not always chafing in the same spot. This can be really dangerous as the loads are so high. It is easy to lose a finger or lose control of the line. You have to wait for a lull, and then work quickly.

Cleaning Up on Deck

We remove everything from on deck. The jib is taken off the roller-furler. We bring the mainsail down below. We even pull all of the halyards out of the mast except for the main, and that is tied way away from the mast so it can't slap.

We leave our hard dinghy in the water, and it quickly sinks from the rain.

The dodger is left on deck. While the wind is from ahead we leave it up. But when the wind is from astern it is folded down and tied off.

Typhoon Omar

Omar was the first storm we went through with this system—in August of 1992—and we weren't as well prepared as we were for subsequent blows.

Omar blew a steady 125 knots. It was blowing so hard that you had to wear a face mask on deck. It was impossible to stand. To move around we had to crawl. With all of *Sunflower's* freeboard, there were times when we had the rail in the water!

Liggett

During the blow. Note the even distribution of load on the windward bow lines. This is crucial to reducing stretch and chafe. You can see hose being used for chafe gear on the bow of the boat in the foreground.

In the next boat over someone is adjusting their bow lines and chafing gear.

Biggest Concerns

We asked what the biggest concern was.

What you are always worried about is someone else's boat getting free and damaging you. There is also some risk from flying debris.

In one storm a sheet of plywood impaled itself on a friend's doghouse, opening a huge hole and acting as a funnel for the torrential rains. Fortunately, nobody was hurt, but they spent a lot of time trying to stay ahead of the water in the bilges.

It is important to get into your hurricane hole early. You can't wait until the last minute. We watch the storms, and frequently move to the refuge before anyone else. Even when the weather guys say the storm is going to miss, you just never know when they will change direction, speed up, or slow down.

Al, Beth, and *Sunflower* have spent the past year in Asia.They missed the "big one" this year. Typhoon Paka had 160 knots of steady wind with gusts to 200 knots.

Still the Guamanian system worked. There were some rigs came down, and a boat or two came loose and blew through the air. But no boats were lost in the harbor of refuge, and more important, the crews all came through safely.

Help

(Above) Ideally you want the wind on the bow or stern, but when you are laced into a web like this if it comes on he beam there's not much you can do. The heel on the boats in the background in this image indicate there's some angle to the breeze.

Note how stripped the decks and rig are off all these boats. Dodgers, roller-furling headsails and even mainsails have been removed to reduce windage.

Hunky Dory (left) did not fare as well as the boats in the shelter. She ended up ashore with a hole in her side.

This Wharram cat (right photo) was picked up, flipped over, and driven ashore 70 feet (22 meters) from the water.

Liggett

Help

Richard Le Quesne

Richard Le Quesne fits the mold of the other professionals to whom we've introduced you so far. He's a Brit, started sailing at an early age, and by 1976/77 he was supervising the construction of a Bowman 46 (at that time considered a state-of-the-art cruiser).

By the late 1980s Richard was skipper of a Swan 76 ketch and sailed her from California to the Caribbean, to New England, back to the Caribbean, to the Mediterranean and back to California.

Earlier this year he signed off after seven-and-a-half years as skipper of *Diamond Forever* (ex *Acharne*), a 120-foot cruising sloop. (For real sailing pleasure Richard owns a half-share in a 1963 wooden Dragon which lies at Cannes Yacht Club in the south of France.)

Richard picks up the commentary from here:

"Before each passage I will give a safety briefing followed by a question and answer session and a tour of the yacht to locate important features. The main elements of my briefing are two: Expect to die if you fall overboard because we probably won't find you, so don't do it. And if you see, hear or smell something that might be unusual, ask."

The Meaning of Seamanship

Good seamanship arises out of what I like to call "awareness." A thorough awareness of all the circumstances, one's own abilities and limitations, the current weather and its likely evolution, the vessel's position and the constraints imposed by land/or other dangers, the crew's ability and their individual reserves of strength, the vessels's seaworthiness and its particular characteristics (especially the first one) is likely, I believe, to lead to sound decisions.

And this idea leads on to one of my particular hobby-horses, which is the immense importance of looking at the "big picture." It is far too easy for a skipper who is nervous or tired or uncertain to focus too much of his ability on a particular part of the job, say position fixing, and to give insufficient attention to to some other part of the job such as keeping a good lookout or ensuring the well being of the crew with the result that he allows the overall situation to deteriorate unnecessarily.

In summary, a *thorough* awareness of all the circumstances likely to lead to a realistic assessment of the available courses of action and to a correct choice from among them.

"My current thinking is that big offshore yachts ought to be ketch-rigged rather than sloops and that they should carry a small 'bullet proof' staysail set on a separate stay aft of the every-day furling staysail."

Heavy Weather Tactics

This is a matter that has worried me as I have moved up to sailing super yachts. On smaller yachts, say up to 40 or 50 feet long, it is (or used to be) quite common to have one or more smaller and heavier headsails that could be bent on in anticipation of heavy weather and this gave the skipper the option of continuing to sail until the conditions became so extreme that it was no longer desirable to do so.

Cruising yachts bigger than this sometimes also have the possibility of setting a heavy-weather headsail but usually the headsail is set on a furler and changing headsails can be difficult or even impossible if left until too late. This can be less of a problem if the yacht is cutter rigged and the staysail has been built heavy enough to serve as a storm sail.

Almost any of the yachts in this size range, say up to 100 feet long that have been designed for offshore sailing (and here I specifically exclude modern light-displacement yachts with shallow midship sections) that can set a small, heavy sail forward of the main mast will be able to heave to and this, in my opinion, is often the best tactic in anything less than survival conditions.

I believe that too many skippers do not recognize the advantages of heaving to in order to protect the yacht and her crew from the wear and tear imposed by heavy weather. Furthermore, running for shelter in deteriorating conditions can lead to strandings, injuries and fatalities that could have been avoided by heaving to when still offshore.

Key items about which the skipper should be aware:

- ❑ The weather.
- ❑ Your own abilities and limitations.
- ❑ Current weather and likely evolution.
- ❑ The vessels position.
- ❑ Constraints posed by land/or other obstructions.
- ❑ The crew's abilities and their individual reserves of strength.
- ❑ The vessel's seaworthiness and an awareness of its particular characteristics.
- ❑ Maintain an overall awareness of the big picture.

One December when I was very late in leaving New England with the Swan because of yard work we caught a storm system just right and flew down to a position just west of Bermuda. Here we lost the effect of the original storm system and started to pick up the next (which we rode almost all the way down to Tortola) and for a few hours the conditions caused by the crossing winds and waves were such that the best course of action was to heave to and batten down. In that interlude we tidied up below, had a hot meal and a bit of a wash and a rest before we continued our sleigh ride southwards.

The question of what to do when a really big modern yacht meets heavy weather is one that I cannot answer. The traditionally rigged yachts are able to progressively reduce sail but the modern rigs have limited possibilities in this respect and regrettably, in my opinion, have to rely on furlers. I have sailed *Diamond Forever* (120 feet/36.6 meters and 200 tons) in 40 and 50 knots of wind with just a partly rolled staysail and I am terrified by the strains that this puts on the sail and the gear, but she is a sloop and lying ahull is not an attractive option.

What to Learn

I have the feeling that many people are buying (and hence skippering) their own yachts too soon. There is absolutely no substitute for the experience and knowledge that is gained by going to sea as crew on someone else's yacht. Even better is to go to sea on more than one yacht and to see how different skippers operate.

Related to this is the matter of boat handling which is best learned on small boats. A yacht of 30 feet or more is not a suitable platform on which to learn boat handling because it is not sufficiently responsive to demonstrate the direct connections between an action and its effect and also because its weight (and value) discourage running the risk of making a mistake. The hours spent in a sailing dayboat, a launch or an outboard powered tender teach skills that are invaluable later on.

Having gone back and re-read all this I think that it is probably just as well that lack of time forces me to stop here. You might get very bored if I went on.

Dinghy Seamanship

The ideal dinghy landing spot: a pristine white beach protected from ocean waves, clear water, and three good looking ladies (not to mention a shapely profile offshore). This is Uvea Atoll, in the Loyalty Islands, on the north side of French New Caledonia.

We consider sailing offshore a lot safer than driving our car. We don't even think of working our way through reef-strewn areas without the best visibility as dangerous—risky to the boat yes, but not to our own life and limb. But when it comes to taking our dinghy ashore for an evening meal in a popular anchorage, we both get a bit nervous.

Why? Because there are more accidents with dinghies by far, than occur on the mother ships. These often involve excessive consumption of alcohol, but at other times it is just the crossing a wake, improperly handled, that starts a chain of events.

So we think that in a book focused on defensive seamanship, a section on handling a dinghy safely has its place.

We'll start out talking about basic dinghy safety and seamanship. You will find considerable difference, for example, in handling an inflatable or a hard-bottom dink, and between a soft-bottomed inflatable and a RIB.

Then we'll discuss getting the boat ashore through surf. We'll end up with a chapter on towing techniques.

Safety Issues

Safety issues with dinghies are much the same as with bigger vessels—except they occur more frequently due to the small scale of the boats in question. In general, as with bigger boats, all of this discussion revolves around common sense.

Help

Staying in the Boat

The first safety issue is staying in the boat! This may seem self-evident, but being tossed out of a moving dinghy is one of the leading causes of accidents.

This past spring, during Antigua Race Week, two occupants of a speeding inflatable were tossed out at night, as they swerved to avoid a channel marker.

The driver was not wearing his emergency stop wrist strap, so the outboard proceeded to run in circles, nearly hitting the former occupants. Their frantic cries were finally heard by a boat anchored nearby and the loose dink was corralled, and the crew picked up. Luckily, nobody was injured in the event, but often these accidents end with the prop doing a dance over someone's body.

Staying in the boat means having a firm grip on the gunnels or hand lines. It also means avoiding abrupt movements by the driver.

One of the dinghy docks in Bequia, in the West Indies. You will see all sorts of boats and boating skills here! And it is fun watching the antics of some of the less knowledgable. But keep a wary eye posted—because an outboard-powered dinghy can create death and destruction in a matter of seconds.

On crowded docks it allows more room for everyone if the dinks are tied with a long painter, rather than snubbed short.

Keeping Upright

The next issue is remaining upright—avoiding capsize. While this seems self-evident, the risks from a capsize can be substantial, especially in colder water. Inflatables have far greater stability than do most hard dinghies, due to their greater beam. On the other hand, they are much more difficult to right after a capsize.

Leaving aside taking a dinghy through the surf—which we'll cover in the next chapter—staying upright is a function of form stability versus the center of gravity of the crew and any upsetting forces.

A major factor in staying upright is not having an excessive payload. Consider what would happen to this boat—a 10-foot (3-meter) model with six adults—if they were to hit a sizable wake. Swamping would be unavoidable.

Should the kids wear life jackets in the dink? Our feeling is that if they are competent swimmers, and water savy, unless conditions are dangerous it is not necessary. The Swiss family in the top photo is just getting used to cruising, and these little guys have not yet learned to swim. The "water wings" their kids are wearing could be dangerous as they often will not keep the child's head out of the water.

On the other hand, Elyse and Sarah, Eric and Tara Naranjo, and Daniel and Veronica Hast are three quarters of the way through a circumnavigation when this shot was taken in Mauritius (Indian Ocean) and capable of swimming to shore from the boat. I wonder where you would stow the life jackets necessary to be legal in many areas of the world?

The closer you are to the center of the boat, and the lower in the boat you are, the better the capsize resistance.

The upsetting energy usually comes from the wakes of other boats. To the extent that these threaten you, reduce speed and head into or directly away from them (just as you would with a breaking sea on the mother ship).

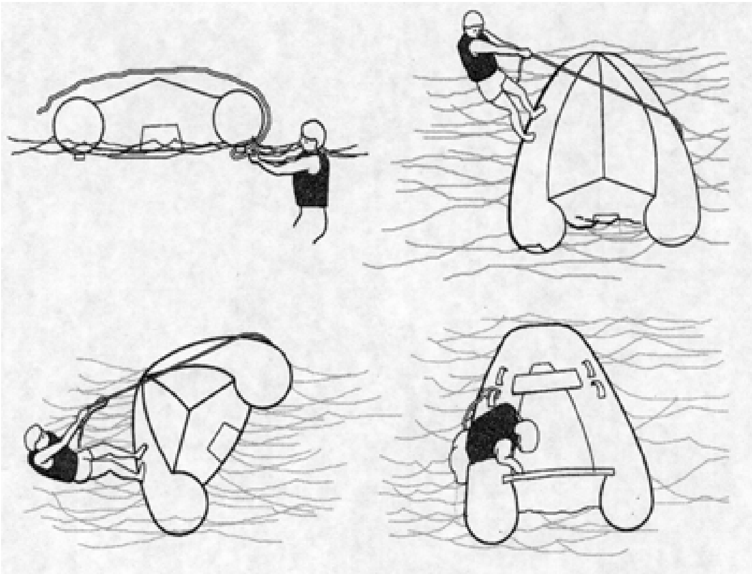
In strong winds there is a risk of the boat being blown bow over transom if the bow is accelerated vertically by a steep wave face. This can often be dealt with by judicious use of the throttle.

Righting a Swamped Boat

Most hard dinks, and medium-sized inflatables can be righted from a swamping with relative ease. The key will be to break any suction which is in effect between the upturned dink and the water. The smoother the sea conditions, the more difficult this may be.

Having a righting line, as with small catamarans, so that one or more crew can place their feet against the side of the dink, and then pull the line across the bottom, is the best system.

Help



Righting a swamped inflatable takes much the same technique as is used with a life raft, or catamaran. The easiest system is to use a righting line, as shown in the drawing beside. When we head offshore, with the possibility that the dink may become a life raft, a righting line is rigged in advance. Otherwise, the painter can always be used. Give this a try some day (without the outboard!). You will be surprised with larger dinks how much force is required to get them back.

Practice with this when weather and water temperature permits, so you will understand the technique if it ever becomes necessary in ernest.

Once the dink is swamped you will need to bail it out to the point where there is enough freeboard to get back into the boat and continue bailing.

Depending on buoyancy, and freeboard, this may be more or less difficult. The more efficient your bailer, the better job you can do. We make a habit of carrying our dinghy anchor and rode in a heavy bucket, which makes a wonderful bailer in emergencies.

Keep in mind that under no circumstances should anyone ever leave the swamped boat. You are far more visible with the boat, and it provides buoyancy. If you cannot right the boat, use the painter to make a safety line over the upturned bottom, and then climb up on top, out of the water, so the risks from hypothermia are reduced.

Preparing for the Worst

We always like to prepare for the worst with our dink rides. This is, of course, a function of the level of risk if something goes wrong. If you are in a protected anchorage, with lots of neighbors, and light winds, if the engine quits odds are you will be able to get help, or if not, just drift to a nearby beach.

But what happens if the wind is strongly offshore, there's hundreds of miles of distance to leeward, and your engine quits?

In the potential worst case scenarios we carry a small waterproof bag with a handheld VHF, inexpensive GPS, spare set of spark plugs for the dink plus changing tools, along with a pair of pliers, phillips head and standard screwdriver, and a knife.

To try to avoid the problem in the first place we also carry a five-pound dinghy anchor with 20-feet (6-meters) of 3/16-inch (4.5-millimeter) chain and 250-feet (75-meters) of 1/4-inch (6-millimeter) line.

Using the dink in fog:

- ❏ Assume you will become disoriented and carry some form of navigational gear.
- ❏ A compass (and maybe a harbor chart) is a bare minimum.
- ❏ GPS, with a waypoint for the anchored location of the mother ship.
- ❏ If there are risks of drifting out to see, stay on shore.
- ❏ If you become disoriented be prepared to anchor the dink. The fog may lift somewhat after a period of time.
- ❏ When leaving the mother ship turn on the masthead as well as spreader lights. The latter are often much more visible.
- ❏ If you are caught without nav gear, wave and wind direction cam sometimes be used for directional information.

But the best guarantee of getting back to safety is a good pair of oars, a set which are long enough to actually propel the dinghy against some adverse winds. Some of our friends carry basic smoke and flare signaling devices as well.

With hard dinks the risks from engine failure are much less because they are so much easier to row. In either case, remember to tilt the engine up as the drag from the outboard prop and lower unit are substantial.

Avoiding Collisions

Collisions—with other boats or obstructions, is the leading cause of accidents in small boats. Most of these accidents involve the use of alcohol on at least one crew's part.

The first part of avoiding collisions, therefore, is simple. Don't drink and drive. And if you are using your dinghy at night in crowded anchorages where people are likely to be drinking (ashore or on other boats) be extremely watchful.

Be particularly careful of "blind intersections" where you cannot see the other guy. When you are passing through a crowded anchorage try to pick the path with the least traffic, and slow down as you come around the bows and sterns of the anchored boats if there is a risk of someone coming at right angles to your course.

Running at Night

It goes without saying that most problems happen at night when visibility is reduced. The best situation is to have running lights on your dinghy. Since this is often impractical a set of flashlights, one aimed forward and the other aft, is the next best bet. Be sure these do not ruin your night vision, and when you see another boat, avoid shining the lights in the other crew's eyes.

Nantucket Fog

You wouldn't think a short ride from shore to the boat in a protected harbor could be dangerous, but as we were finishing this book we had an "interesting" experience in Nantucket. We'd gone ashore for the 1900 movie and come out to the beginnings of fog. Not thinking too much about the issues involved we stopped at the grocery store, and by the time we were aboard the dink the fog had really closed in.

Beowulf was anchored well past the mooring field, about a quarter-mile from the docks. We tried twice using the edge of the moored boats to find her with no luck, finding ourselves at the edge of the entrance channel heading out of the harbor on one occasion. There wasn't a hope of finding a place to stay ashore so we were thinking about sleeping in the dink when we came to *Zopilote*, the motor yacht of our friends the Kesslers. From *Zopilote* we called the harbor launch, which was equipped with a compass, to guide us back. Very embarrassing, and if we'd gone out the entrance channel...

Small Boat Handling

For the most part proper handling of dinghies is easily learned, and a bit of private formal practice goes a long way. Knowing how to control the dink will not only save some embarrassing moments, but may at some point affect your safety if you have to dodge another boat or an obstruction.

Rowing and Sculling

There are several important factors for rowing efficiently. The first is your legs must be braced effectively, either against the aft buoyancy tank, or foot blocks. This allows the use of leg as well as chest muscles.

Next, a proper set of oars must be used. These will probably be much longer than what you are commonly used to.

The proper length is a function of the strength of the crew and the beam of the boat.

The wider the beam, the longer a set of oars can be for a given amount of effort. There are no set formulas for this. The best approach is to test different oar lengths in smooth conditions, and then again in some breeze.

With many inflatables it is impossible for one person to row effectively sitting down. However, if the oars are long enough, it can be relatively efficient to stand in the stern and lean forward into the oars. or sit on your knees doing the same. If this is not practical, it may be better to supply the inflatable with two canoe style paddles.

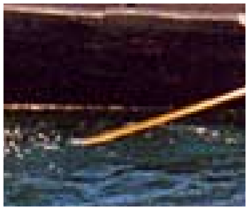
If you can control the oars, and there is a headwind, it helps tremendously to feather the oars—(rotate them 90-degrees so the blades are parallel with the water) between strokes. This substantially reduces air drag and the effect of the oars tripping on the chop.

Feathering is accomplished by twisting the wrists as the oars are lifted at the end of each power stroke, and then unrotating as the oar is being dipped again for the next power stroke.

Each dinghy will have a speed at which you get the best mileage for the energy expended.

Dinghy safety kit (for potentially dangerous situations):

- ❏ Anchoring system.
- ❏ Heavy bailer (such as the anchor storage bucket).
- ❏ VHF.
- ❏ GPS.
- ❏ Spark plug set.
- ❏ Tools to change spark plugs, and deal with other minor maintenance issues.
- ❏ Spare starting cord.
- ❏ Basic smoke and flare kit.



Feathering oars on the return stroke reduce windage and help minimize oars catching the wave tops. In the upper photo the oars have been feathered by twisting the wrists. In the bottom photo the oars are again vertical, about to be dipped back into the water for the power stroke.

Typically this is at about one-third of your strength level in smooth conditions. As the speed increases, drag goes up with the square of the velocity, so above a certain threshold, it gets very inefficient.

One technique rarely seen with inflatables, which could be very efficient, is sculling. In this method a longer oar is used over the transom, and worked back and forth to provide propulsion forward. How well this works depends on the resistance to sideways movement of the hull shape. With the deeper V-hull RIBs it will work well, but some of the flat-bottomed boats do not have enough lateral stability.

Outboard Basics

Handling an outboard in close quarters takes some getting used to. Once you get the hang of it, the ability to direct the prop thrust becomes a huge benefit.

In general, less throttle is always better.

When coming alongside a dock or another boat, a long gently curving approach is easiest. Right angle approaches, which require an abrupt turn at the end, rarely work out as planned.

However, a modest amount of turning momentum just as you come alongside can be used to push you gently against the dock (or hull).

This technique is especially helpful if there is a wind blowing you off the dock.

The stern will turn away from the center of the turning radius. In other words, it kicks out from the center and the bow kicks in.

This becomes important when trying to avoid an obstacle—maybe a swimmer. If the obstacle is coming down the hull, to avoid it you will need to turn towards it, once it is past amidships. This moves the stern out and away from the obstruction.

Shallow Water

Even small nicks on outboard props have a big effect on performance, so it is a good idea to keep them off the bottom and out of the coral. Almost all outboards have a shallow water running position, where they are tilted up 20-degrees or so to reduce the effective draft.

The time to do this is before you reach shallow water! When the outboard can no longer be used, row or pole yourself along. In extreme shallow water it may be necessary to get out and push/pull the dink into deeper conditions.

Choosing the Right Course

There are often times when the driest, most comfortable ride is something other than a straight line.

Take a cross-wind, cross-sea situation. In most dinghies this is going to be very wet. However, if you head upwind, at a 30-degree angle or so to the wind, and then tack downwind with the wind on the quarter, you may be able to stay dry during the trip.

Broaching

Broaching is usually not a problem going downwind, unless the chop starts to build. The best way to reduce the risk is to keep speed below that of the waves, or stay on the backs of the waves (when you get on the face of the wave there is a tendency for the bow to dig in, and then the boat can pivot around the dug-in bow).

Anchor Out?

If you have a dink which is light enough to drag onto the beach, or one with wheels on the back end, it will be easy to get the boat well above the high water mark.

But for many inflatables, especially the larger models with big outboards, dragging the boat up the beach just isn't practical.

There are two answers. One is to drop the beach-goers ashore and take the dink back out. The second is to anchor the boat outside any waves which may be breaking. If you are taking this latter course, consider the current and any shifts in the wind. If it is likely the boat will be swung further away from shore than it is prudent to swim, part of the anchor rode can be used to tie one end of the boat to the shore.

Rough Docks

Rough docks can damage an inflatable in short order, especially if there is some chop or wind forcing the boat periodically against or under the wharf in question.

In this situation it is best to use the dink anchor off the stern, to hold the boat away from the obstruction. Enough slack has to be left to get the boat barely to where you can get ashore. When the painter is eased, the boat will slide back out. Remember to allow for the tidal range.

Our 13-year-old Novarania dink anchored off the bottom end of Grenada in the West Indies. With a 30-horsepower outboard, six-gallon fuel tank, and 154 pounds (69.9 kilograms) of hull this dink weighed over 300 pounds (136 kilograms). The two of us could fight it up the beach with a great deal of effort. However, we usually anchored off, which is easier on the boat and the crew.

Help

KIDS AND DINGHIES

Shore break for the dog, and a chance for the kids to get away from their parents and vice versa (Queen Charlotte Islands, British Columbia).

And below, our granddaughter Emma, aged two, picking up where her Mom left off. Emma's favorite thing to do when she visits is drive the "baby boat".

We can tell you from firsthand experience (as kids, parents, and grandparents) that there is no greater thrill for the younger generation than having command of a dinghy. It is such a feeling of power and freedom that unless you have experienced it yourself, as a child, it is difficult to comprehend. Getting kids out on their own in the dink teaches them self-reliance, and brings them closer to understanding and enjoying the operation of the mother vessel. The key is to let them stretch their wings in a safe manner.

Our preference is to start with rowing and then work up to the outboard. And unless the kids are well versed in water safety, including what to do in a swamping, insist life jackets be worn. Beyond this, start with easy venues—protected anchorages, light airs, no current—and try not to be too obvious in the careful watch you keep.

Help

Taking the Dinghy through Surf

The gleaming white beach is a few yards ahead. I am studying the rise and fall of the sea from just outside the surf line, where the swell of the ocean feels the bottom and begins to break on the beach. Linda, seated in the stern of our nine-foot (2.8 meter) Dyer fiberglass dinghy, is relaxed, anticipating the children's joy. Elyse and Sarah, ages two and five, sit in the forward seat in their life jackets, gripping the gunwale with one hand and their buckets and shovels with the other. Just offshore *Intermezzo* stands quietly at anchor, a gentle swell occasionally lifting her stern.

Our situation is one in which most cruisers find themselves at one time or another: an inviting shore beckons just beyond a "beach break" or surf line, and there's no protected way from boat to land. The basic approach to getting through the surf line is similar in many respects to that necessary to coax a yacht across a breaking bar.

The first rule in such a situation is to study carefully, from the outer edge of the break, the rhythm of the surf, counting the wave sequences and noting their size and where and how they break.

Two sets of waves pass under our little dink. "No problem," I say to the ladies seated around me. "I shall deposit you ashore in style."

I give a light heave on the oars, and we coast forward. Now, eyes glued on the sea before me, I jockey the oars to keep our bow straight and the broad stern of the dinghy square to the oncoming wave. Too late I realize I've made a mistake. I have forgotten that a beach break looks much smaller from seaward, from the back side of the wave, than it actually is.

With a rush, the surf has us in its grip. The bow starts to crab sideways. I am unable to straighten out our trajectory. The rail starts to tip while the stern lifts crazily. Instantly we're over, the wave crest depositing the four of us, dinghy, seat cushions, and one oar at the edge of the steep beach. Linda and I grab the kids out of the surf first and then the dink. We pull the oars from the next wave. The boat is intact, and except for a superficial cut on Sarah's head, we are physically unscarred.

Mentally it's a different story. It will be three years before Sarah voluntarily rides a dinghy to shore again unless a dock is present to ease the transition to land.

Picking the Right Set

Rowing into that beach, I had made several major errors. The first was in timing. I should have studied the wave pattern for at least 15 minutes. Beach surf generally arrives in sets of seven to nine waves. Between sets there can be a variance of as much as 100-percent in wave size. The waves within a sequence also vary greatly in size. I hadn't waited for the smallest wave in the set.

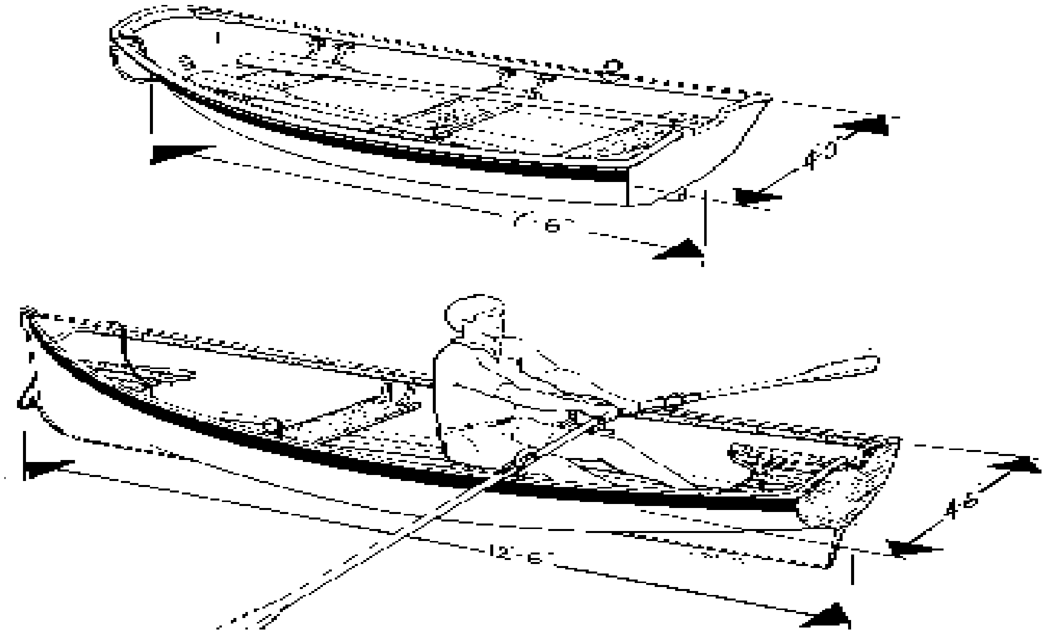
Taking the dinghy ashore through surf:

- ❑ Stay outside the surf line and watch the sets for 15 or more minutes.
- ❑ Get as high in the dinghy as possible for the best viewing angle.
- ❑ Look for the area where the waves break most softly or the break is delayed.
- ❑ Be sure you can make it between sets, so you are not caught by a breaking crest.
- ❑ Will you be able to get back out if the surf is building?
- ❑ Is the mother ship safe if you have to spend the night on the beach?
- ❑ Secure all loose gear so it is not lost in the event of a capsize.

Bringing the dinghy off the beach:

- ❑ Use a high perch to study the surf.
- ❑ Be sure you can reach the incoming waves before they fully break.
- ❑ If using an outboard, pre-start it so it is ready to go without delay.

Help



It is tough to find space for a hard dink which will do well in the surf. The hull needs to be long and lean, for good directional stability. A length-to-beam ratio approaching three-to-one is a minimum.

Stubbier designs, like the pram at the top of the drawing above, are very difficult to control on the face of a wave. The same applies to short, squat inflatables, especially those with soft bottoms.

Next, I had forgotten that waves look much smaller from their backs. I thought I was dealing with a two-foot (600-millimeter) break that in reality was closer to five feet (1.5 meters). Twice the visual height as seen from outside is the forecasting rule we now employ.

Last, this surf was no place for our squat, directionally unstable dinghy powered by short oars.

Hard Dink Design

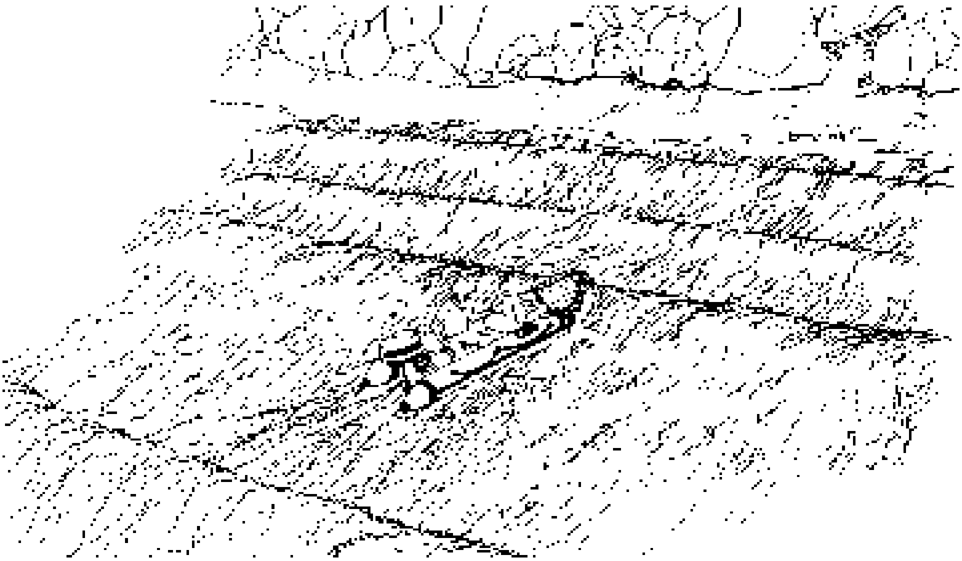
This last problem is one most cruisers face. The dinghy, designed to ferry passengers to a dock or from boat to boat, is too short (for ease of stowage) and beamy (for stability). Since the oars have to stow inside the dink, they are short as well.

All these factors deprive you of the necessary control in the surf line. In reality what is needed in surf is a long, moderate-beam boat with a narrow stern and long, powerful oars. These design characteristics promote boat speed and directional stability.

Powered Inflatables

What if you can't find the room or don't want to put up with the inconvenient stowage of such a dink? A powered inflatable is the answer. The emphasis here is on speed. Planing speed of around 13 knots is the minimum you need. A 10-foot inflatable keel model with a 7.5-horsepower outboard should just reach this speed to ride the back of most waves safely with a load of two adults. The important thing is to stay ahead of the next wave while not powering ahead onto the face of the wave you are riding. Coming back off the beach, the speed will move you out through the surf line before the big waves hit.

Help



Bottom Contour

There are two broad types of beach surf, each of which creates different problems for someone trying to shoot through it.

A rapidly shelving bottom generates a short, steep wave that forms and breaks close to shore in a few seconds. This type of wave is the most difficult to ride in. Conversely, because it forms so close to shore, it's easier to get off the beach and back out through the surf line.

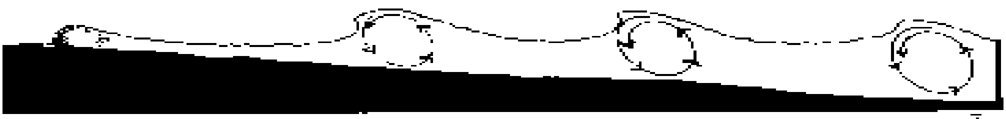
A slowly shoaling seabed, on the other hand, promotes a more gentle wave that begins to form well offshore and has a breaking crest that can be ridden a long way. It is easier to get in with this type wave, but because the break starts well offshore you have a long way to go before you are clear when you try to head back out.

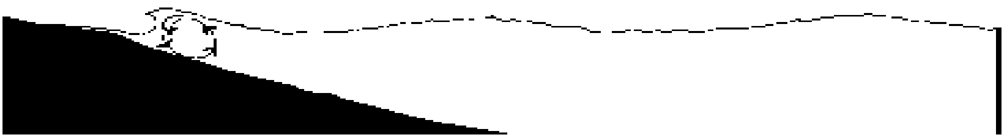
Regardless of the type of dinghy, once it reaches shore, the passengers must disembark quickly and drag the boat out of the reach of the sea before the next wave hits the beach.

You typically have less than ten seconds to get out and start the dinghy up the beach before the next wave is heading at you.

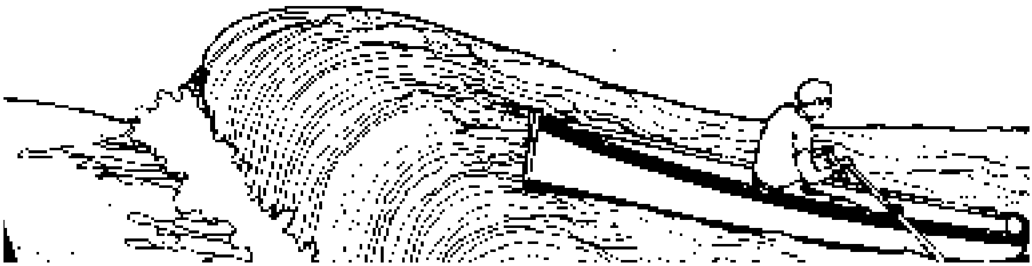
With a RIB or inflatable-bottom dink and an outboard which will keep you planing, it is possible to ride the back of a wave right to the beach. But be careful of getting caught on the front of the crest!

Below, a steeply shelving beach is sometimes easier to deal with as the waves break right near shore.





Help



When rowing ashore there will sometimes be a problem with the backwash of the wave. This runs back out to sea at a high rate of speed on occasion, faster than it is typically possible to row.

Of course there is another wave coming up behind this one and now the boat is going to be in the path of its breaking crest.

The best thing is usually to jump out and quickly drag the boat ashore before the backwash has a chance to move you into deep water.

Viewing Angle

No matter what type of wave there is, one of your most important observational tools is height. Standing up in the dink will give you a better view of conditions. Correlating what you see offshore with what happens a short time later in the surf line helps you predict the right moment for your own ride to the beach. When you're ashore, climb a tree, sand dune, or rock pile to get a better view of the swells and the surf development.

We solved some of our surf problems by trading the Dyer for a 12-foot (3.7 meter) Wherry; over the years this lean, quick, small boat has served us well. Experience eventually led us to buy a special pair of "surf" oars, as well. These eight-footers (2.4 meter) were extra heavy, and I could lay on them with full power to brake our progress or change direction surfing into shore.

Technique

The technique I use depends upon the speed of the breaking waves. If they are slow and I feel I can keep up by rowing, I follow the wave in just behind the crest. This means the dink must stay ahead of the next wave, or it will broach. If the waves are moving quickly, beyond my capacity to stay with one, I try to position us in the top of a crest. The oars are then used to brake our forward speed and to keep the bow headed straight.

It is essential to prevent the boat from surfing down the wave face; that is an invitation to disaster. The loads on the oars are enormous during the braking process; the ones we used were twice as strong (and heavy) as those used for normal rowing.

To ease our passage from shore back out to the boat we added a second pair of oarlocks for the aft seat. With Linda at the main oars and the kids in the bow, I stand in the water at the beach's edge, holding the stern and watching the wave sets roll in. When the waves have temporarily died down, I shove out, jump into the stern, and push on the after set of oars while Linda leans to hers. Our combined power speeds us beyond the surf line before the next wave can form.

Jalapa, Mexico

Our first chance to put this system to the test came in Jalapa, just south of Puerta Vallarta on the west coast of Mexico. *Intermezzo* was anchored

Help

in the open bay of this picturesque, isolated resort. We had come ashore for a walk on *terra firma* before setting off across the Pacific for the Marquesas Islands. As the afternoon wore on, I failed to notice the slight increase in swell sweeping into the bay. Just before dusk, and as we were about to dine, waves began to break on the beach with real force.

There was no choice; we had to get back to *Intermezzo* quickly. For half an hour we waited at the beach's edge for a small set of waves that would allow us to get offshore safely. In the last rays of daylight we launched, and with the help of a substantial flow of adrenaline, Linda and I used our combined power to blast through the break. Our dinner out would have to wait for Nuku Hiva, 2,800 miles to the southwest.

San Salvador Island, the Bahamas: Linda holds the dinghy at the water's edge, bow pointing into the waves. When she judges the moment right, she will run the boat out into deeper water while Sarah pulls mightily on the oars. The trick is to wait until there is a small set of waves, and then go like mad to get past the surf line.

Marquesan Surfmanship

Move with us now to the magic of Taiohae Bay in the Marquesas Islands. Linda and I walk to the beach carrying our new, custom-made Marquesan ukulele, a marvelous four-string cross between a banjo and guitar, carved from a solid chunk of hardwood. Even though the beach break is miniscule I wrap the uke in plastic.

Without watching the waves we launch. We're clear at first, but then a breaking wave farther out from the beach than we expect invites itself into our dinghy, half swamping us. With our buoyancy tanks keeping us afloat, I pull at the oars to get us past the next wave while Linda frantically bails.

The size of buoyancy tanks contribute directly to your safety in a swamping. Bigger is always better. If you can fill your dink with water, continue to row, and bail at the same time, the tanks are large enough.

On to Fatu Hiva, perhaps the most beautiful island in the world. We have come ashore with friends Jim and Cheryl Schmidt for a day exploring at Hanavave. The afternoon ends with the discovery of a local tapa collection, and we excitedly buy several of the beautiful handmade barkcloth paintings.

This is what the professionals use. A working surf boat from the 1950s Caribbean. The only difference today between this boat and the modern lifeguard surf boats is in the materials, and the fact that the lifeguard boats typically have double bottoms.

Escorted to the beach by a group of our new Polynesian friends, we are dismayed to find a large surf breaking just 300 feet (90 meters) offshore. I look at the four adults and two children and then at the 6-horsepower motor that will have to power us and shake my head. Even with Jim's buoyant Zodiac, it looks like a tight squeeze.

The Polynesian Technique

Aha, I think. Now we will see a true example of Polynesian seamanship.

It is all a great joke to our handlers. But now I am concerned and with Jim begin to watch the wave sets in earnest. Our first attempt ends with a breaking wave in the bow. Thankful for the buoyancy of the Zodiac, we pull back to the beach and bail. On our second attempt the overloaded engine tries mightily to gain offing before the next sea forms. We lumber forward, racing the oncoming swell. Our bow begins to lift just as the crest forms, ready to break. With a lunge we are through the crest, intact, and with tapas dry. Had we used Jim's larger engine, we could have made it with ease the first time.

Help

Beach Break

The key to negotiating a beach break successfully is watchfulness and patience. Study the wave patterns, their timing, and how and where they break. Decide if you have the right equipment for the conditions.

If you do decide to go ahead always bear in mind the point of no return. If you err in your timing, don't be afraid to reverse course and wait for another wave set. But once you are fully committed to the surf, keep fighting, regardless of what happens. Although disaster appears imminent, it may still be possible to save the situation by strenuous exertion or a timely maneuver.

A very fuzzy blow up of our hard dink loaded to the gunnels with a heavy duty Marquesan crew. We've brought some villagers from Tahuata to an isolated beach to share in a traditional feast.

There is a 3- to 4-foot (0.9 to 1.2 meters) beach break, and we could not see how they would ever make it ashore without swamping.

Not only were they successful on this trip, but on two more. Nary a drop of water got them or the heaps of food wet.

Just-in-Case Preparations

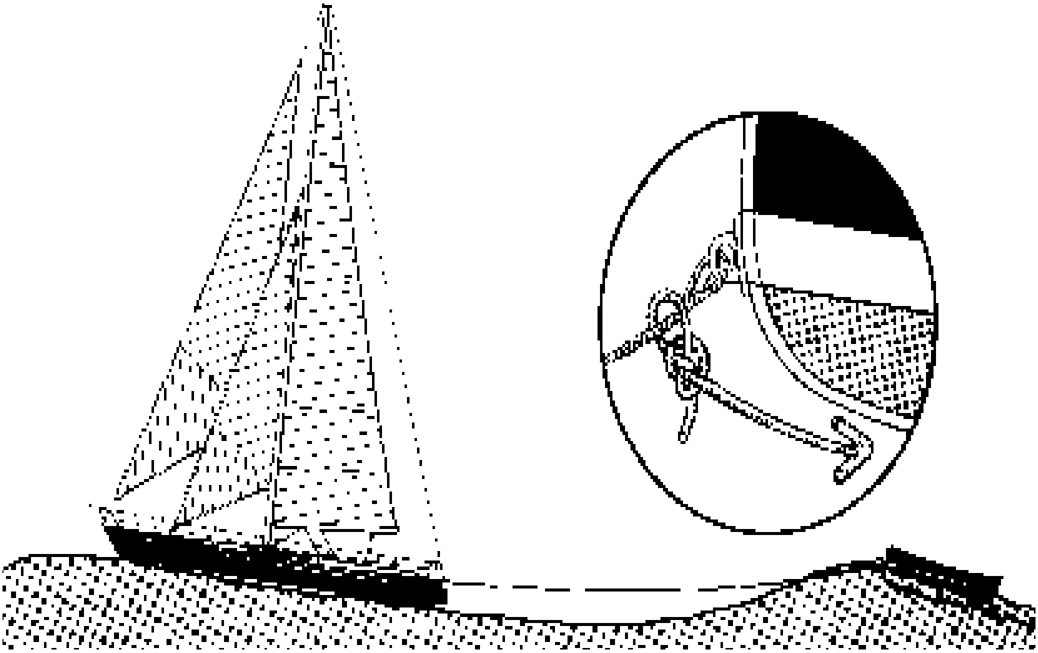
Regardless of how good your surf techniques are you are going to swamp occasionally. If you are prepared in advance, the consequences will be much less severe.

The main problem in a swamping is loss of loose gear to the sea. The best way around this is to tie everything down with light line as a general precaution.

This way, if you swamp, your oars, seats, life jackets, and anchor will stay with the boat.

The other problem typically involves your payload. This may be some freshly washed and dried laundry, or some lovely new carvings. When we have a payload about which we are concerned we put it into heavy garbage bags, and then tie these to the dinghy. Believe me, these last two items have been learned the hard way!

Finally, you may want to consider donning life jackets if the surf is very large.



Towing

When there is a sea running the dink should be towed one wave length behind, so that it has the same relative cycloidal motion as the towing vessel. This keeps the tow line relatively taught.

If the dink is tending to surge ahead, this can often be stopped by dropping an extra sheet down the painter. The drag of the extra line usually stops the dink overrunning the tow rope.

The concept of defensive seamanship dictates that dinghies not be towed offshore. The risk of something going amiss and the dinghy's being swamped or damaged is too high. If a problem does arise with a sea running, getting the dinghy back aboard is virtually impossible. But on short hops between anchorages in semi-protected waters and with the right setup and preparation, most cruisers indulge in the convenience with no problem.

Design Consideration

A number of factors affect a dinghy's towing performance. First is the design of the dink itself. Inflatables with soft bottoms create substantially more drag than RIBs or hard dinks.The inflatables are less likely to broach and swamp. A moderate- or narrow-beam dinghy is more stable under tow than a squat one.

Towing Power

The second consideration is the towing power of the mother ship. Many small auxiliary sailboats have the power to tow their dinghies in nice weather, but when the wind and sea pipe up the extra load presents a problem. The increased drag of the tow can overpower the rig or engine of a small yacht.

I learned this lesson many years ago the hard way. We were en route to Catalina Island off southern California in a small catamaran on a blustery fall day. At the last minute I decided to tow my Dad's 10-foot (3-meter) fiberglass dink so I wouldn't have to beach the cat once we arrived. Sail-

Help

ing out of Los Angeles we had the situation well in hand, but as the afternoon wore on, the sea and breeze built. Finally, as we neared the island, we found we couldn't make reasonable progress to weather. The drag of the dink was too much. Coming about was also a problem. Because the extra drag held back our stern, we couldn't make it through the eye of the wind. Our upwind performance had deteriorated so badly I was afraid that if I jibed, the ground we lost to leeward would make it impossible for us to return to the Los Angeles breakwater entrance. The situation was finally resolved in a somewhat unorthodox manner. We caught the dink square between our stern and using it as a brake on the backwards drift, we were able to blow our bow about with the jib. Admittedly, our dink was out of proportion to the mother ship, but an inflatable behind a small auxiliary sailboat can create the same problem in heavy going.

Towing at slow speeds, as shown in these two photos, can be done with the dink close to the transom. But as the boat speed and sea state increase, the dinghy will often see quite a bit more load close than if it was allowed to trail further astern. Note the two different bridle systems in use. It is always better to remove the outboard—reducing drag and risk to the outboard itself.

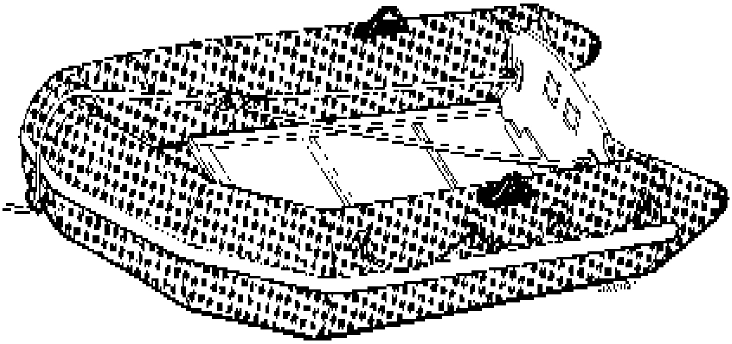
Towing Downwind

Towing downwind can present problems, too. Cruisers are frequently lulled into towing their dinghy on a nice day. Then the wind picks up. As seas build, dinghies, because they are lighter and accelerate quickly, tend to surf down the wave faces towards their mother ship. We have seen dinghies careen madly down a sea, swerve past the stern of the towing boat, reach the limit of the painter as they pass the stern,

Help

The towing loads on the bridle can be quite high, sometimes higher than the average towing rings on inflatable will handle.

We've had good success by tieing the end of the bridles to eye bolts in the transom, and then running the bridle through a ring on top of the bow tube (not shown here) or through the towing eye (in which there will be some chafe).



and then be jerked into the topsides. This scenario usually ends up in a swamping. The violent changes in direction are too much for the lateral stability of the smaller boat.

If you do get caught in this situation and are unable to bring the dinghy aboard, sometimes creating a drogue from a spare sheet will stabilize the towed boat. Tie the sheet in a loop and secure one end to the painter. Then, drop it in the water and allow it to slide down the painter. Take care when bringing the dink alongside that you do not get the drogue caught in the prop or rudder.

Towing Rules

Over the years we have evolved some guidelines to reduce the risks of towing our dinks. First, we never tow offshore or inshore where there is risk of a sea making up. We pick days when the weather appears to have settled and trips that will be only a few hours at most. Next we remove all gear from the dink—especially the outboard motor (if we are towing in protected waters, we sometimes break this rule and leave the outboard on, but then we tie it securely in the tilted-up position). We also make up a special towing painter, one that is long enough to hold the dinghy behind the wave crest following our stern in case a sea gets up, making it necessary to let the dink further aft.

We have found that floating line works best as a painter. It minimizes the chance of fouling our propeller.

The Bridle

Towing eyes have to be extremely stout. In fiberglass dinghies I like to glass into the bow a substantial backing block through which the bolts for the eye pass. The towing eye should be near the waterline to reduce the painter's tendency to pull the bow over into a broach. When we tow an inflatable, we pass a line through the molded towing eye in the bow and fasten it in the form of a bridle to eyebolts in the solid stern. This setup has the advantage of allowing us to tow from the proper point but puts the loads into a hefty chunk of wood. Most cruisers who don't practice this system with their inflatables end up replacing the towing eyes every year or so.

Help

Stock Newport

Hard Bottom Inflatables

Hard-bottom inflatables (RIBs) can be towed through a wider range of conditions. They have the sideways stability to tolerate a certain amount of wave impact and the directional stability to track.

They must have, however, a really secure bridle as the towing loads can build up quickly.

How Far Astern Do You Tow?

How we handle the tow once we've set everything up depends on the dink and on sea conditions. We usually start out towing a rigid boat about three dink lengths behind. As a sea begins to build, we drop the dink back to the back of the wave behind our stern. The aim is to have the dinghy always trying to climb over the crest.

On *Intermezzo II* when we anchored or maneuvered in tight quarters our dink was always pulled up snug to the stainless steel boarding ladder on our transom. That kept it off the topsides and the painter out of the propeller. Yachts with conventional transom sterns cannot avail themselves of this technique. In that situation we find it better to tie the dink alongside to keep it out of the way.

Inflatables sometimes tow best snugged right up to the sternrail, with the bow lifted clear of the water. For this to work the freeboard of the towing vessel has to be low enough so that the dink's bow can be held snugly against the transom of the mother ship. On larger boats the dink can be held instead to a special padeye bolted to the transom.

One of the major risks to the dinghy when it is being towed is filling with water. Whether it comes from spray, broaching, or errant wave tops, even a small amount of water makes a large difference in overall towing weight, rapidly increasing the strain on the gear. To reduce this risk, consider strapping a full, tight-fitting cover on the dink.

Finally, even though we never start towing unless the weather is fair, we always rig the dinghy's lift sling. That way, if conditions deteriorate, we have a chance to get the boat aboard before it is too late.

Before we leave the subject of dinghies a comment on tieing them to the mother ship is in order. We'd forgotten about this subject until some folks were visiting us in Bristol, Rhode Island, and when they were ready to leave, no dinghy! The boat anchored to leeward had picked it up, and our visitors were most embarrased. However, having a dink drift loose is like running aground. It is not a question of if it will happen, but when. In our case, it has happened a number of times, usually as the result of the various folks getting out of the dink assuming the others have dealt with tieing it up.

Many cruisers use snapshackles of some form. However, we prefer to use a bowline: it helps keep us in practice. Also, we've learned to use the towing bridle for attachment in windy spots (having pulled out the D-rings on the inflatable several times).

Help

UNDER POWER

Camden, Maine—a lovely, but very tight harbor. You will need to be on your toes when maneuvering in this type of confined space.

When we started cruising with *Intermezzo* most of our previous sailing had been in engineless racing boats. So, at first, having that diesel to fire up any time we had a tight spot to get into or out of was really neat.

However, it wasn't too long before we'd had a few minor engine problems (overheating, transmission failure, dinghy painter or sheet in the prop). As a result, we came to cast a wary eye on the engine and what it could or could not do for us.

Our basic rule became never go anywhere if engine failure would result in serious damage to the boat.

To mitigate the risk in the event of engine failure this meant having the sail covers off, halyards attached and ready to hoist, and anchor ready to drop.

As our yachts became newer and the propulsion systems better engineered (with easier access for preventive maintenance) driveline malfunctions (except for lines in the prop) have become rare. Still, we are always ready to sail or anchor within a few seconds if need be.

In this section we'll start out with design characteristics and how they affect handling under power, then move to how to determine the maneuvering characteristics of a boat and use them to advantage (or minimize the hassles). We'll then get into the nitty gritty of docking and tieing up—mainly aimed at difficult situations.

The one basic rule which we always stress to our clients, and which we practice ourselves, is: When in doubt—don't. It is always better to anchor out and use the dinghy until you can assess the situation and then work your way in under power.

Help

Design Issues

When it comes to motoring, no two boats are alike. However, while the exact techniques applicable to your boat may be superfluous on another, there are some common basics to operating any sailboat under power.

Sailboats with large engines, efficient propellers, spade rudders, cutaway or fin keels, and low-windage rigs and hulls have the most going for them. But as engine power or propeller performance is reduced, so is the ability to use brute force to accomplish your desires, and the requirements for finesse increase.

The type of propeller a sailboat has and the boat's hull shape and the rudder design are particularly critical in determining how a sailboat backs down. Vessels with long waterlines, directionally stable hulls, and spade rudders are the easiest to maneuver in reverse, while those with long overhanging ends, full keels, and attached rudders are the hardest. Vessels with skeg-mounted rudders fall somewhere in between, and woe betide the sailor who has to master reversing a vessel with an offset prop.

Propeller Action

There's not much you can do about your underwater configuration but there is a lot you can do with your prop. Fixed props can be quite efficient providing forward thrust if they have significant blade area. However, with most sail boats an efficient fixed prop is apt to be a real drag for sailing (pun intended). Fixed props also exhibit asymmetric thrust between forward and reverse. This means they have a lot less thrust (usually about half) when backing down than they do going forward. Fixed props also have more side torque in reverse which causes stern walk.

Folding props are efficient under sail, but do not provide quite as much forward thrust. However, their real drawback is in reverse. These props depend on centrifugal force plus thrust to open all the way. This works great going ahead, but in reverse the blades don't open all the way so backing down is less efficient.

Feathering props, like the Maxi props do not have as much forward thrust as fixed propellers, but are good for sailing when the blades are feathered. These propellers have a symmetrical blade without twist and have the same thrust in reverse as they do going ahead. The result is good stopping power and a reduction in stern walk.

The ultimate prop system is one which allows you to adjust twist in forward or reverse and to feather the blades when sailing. These are made mainly by Hundested (it is what we have on *Beowulf*). By adjusting the amount of torque you can control stern walk or eliminate it, have an efficient shape when sailing, and optimized powering for any condition encountered.

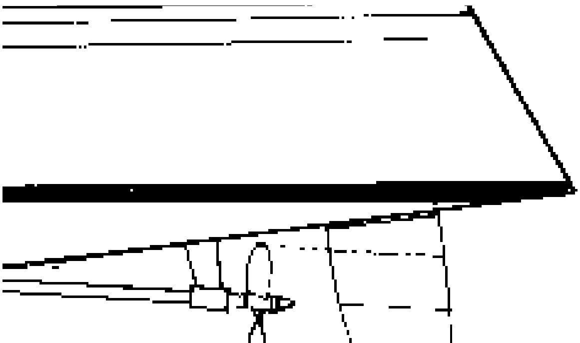
The majority of sailors find that maneuvering in tight quarters under power is the most difficult aspect of boat handling. Part of this is due to inherent yacht design issues (about which you can do little) and part is due to a lack of understanding of how to get their boats into and out of tight spots.

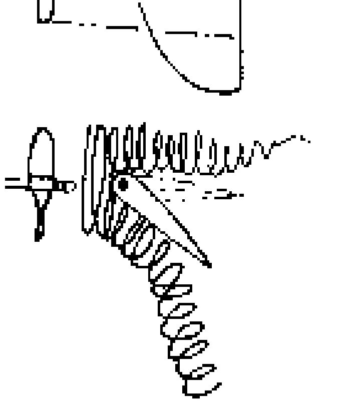
Over the years, when we've done sea-trials with our clients, we've spent more time familiarizing our owners with power characteristics than anything else—because it is under power, in tight anchorages or marinas, where one is most apt to get into embarrassing situations.

Windage plays a large albeit variable roll in maneuvering under power. The more windage you have, relative to how much boat is in the water, the harder will be your job when the wind is on the beam.

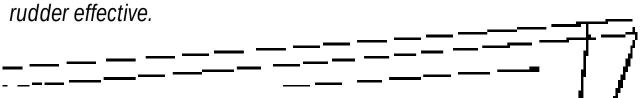
On the other hand, windage can sometimes make the job easier, if you plan ahead on how to use the breeze to turn the boat and/or slow it down.

Help

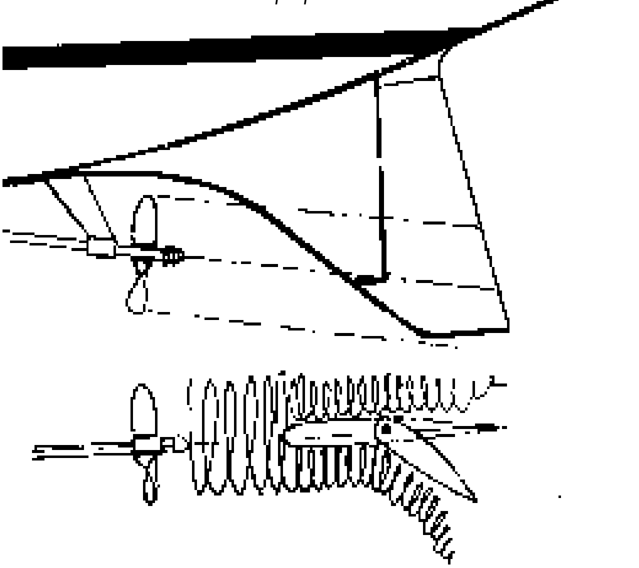




The most efficient arrangement for maneuvering is a spade rudder with the propeller close to the leading edge. This way, when the rudder is turned to the side it deflects a larger percentage of the thrust coming off the prop—which acts to push the stern to the side, even when there is not enough speed through the water to make the rudder effective.



A skeg-mounted rudder forces the prop further forward (unless the prop is in a cutout). As a result, there is less blade area with which to divert prop thrust.



Prop/Rudder Relationship

The prop and rudder have a complex relationship. The rudder can act as a stator for the prop, straightening out the twisted flow coming off the blades and making it more efficient.

The rudder can also act as a flow director, making, in effect, a huge thruster out of the engine and prop which can be used to good effect when maneuvering.

The prop wash over the rudder can also make steering under power difficult. All of these characteristics depend on the size and design of the prop, its distance from the hull, its proximity to the rudder, and the shape of the rudder.

Visualize a spade rudder mounted close to the prop. When the rudder is turned at a 40-degree angle a good quarter of the horsepower of the engine is deflected sideways. The closer the prop and rudder are to one another, the more efficient this is. How far the rudder can be turned before it hits the stops is also an issue.

If you switch to a skeg-mounted rudder, with the same prop and distance between, only the after portion of the rudder which pivots off the back of the skeg can act as a thrust deflector. Not only is this further away and so less efficient, but half of the initial thrust off the prop is lost going down the side away from which the rudder is turned.

Maneuvering Characteristics

All of this design stuff yields a vessel with a certain, hopefully consistent, set of handling characteristics. The key is to experiment to find out what some of the responses are to various helm and engine inputs.

The best system we know of is to start out with an anchored inflatable, and then use this as a soft target against which to judge how your maneuvers go (paying heed of course to the dinghy anchor rode so that it does not end up in the prop!).

Pivot Point

All yachts have a point about which they rotate going forward, when going astern, and when using prop torque to turn.

As you would imagine, this varies with hull and fin configuration. Shallow canoe-body-type hulls, with small keels and space rudders, typically rotate about a point towards the aft end of the keel.

As the rudders get less efficient, the hull deeper, and the keel longer, this pivot point usually moves forward. The tricky thing here is, however, that the pivot point can move depending on what you are doing and how much wind there is.

It is important to test out your boat in a variety of situations to see where and how it pivots where there is plenty of room to experiment.

Turning Radius

Turning radius varies not only with boat design but with boat speed. For most yachts there is a trade-off here. Up to a point going faster may help you turn more quickly. But after that point the turning radius increases dramatically. The best way to find this point is to experiment.

Stern Swing

All boats swing their stern out as they turn. Of course, this varies with design type. If you are powering close aboard a dock to starboard and turn to port the stern will swing out faster than the bow swings in. That dock will get close very fast. So how fast you can turn away from something needs to be learned.

This is especially true in man overboard recovery situations. If there is an obstruction (or person) sliding down one side and you turn away from it/them, the action of turning the bow away turns the stern and its propeller into the obstruction.

Heavy designs with long keels swing their sterns out a lot less than light boats with small keels and spade rudders.

Center of Lateral Resistance

Every vessel has a center of lateral resistance (CLR). This is the point where when you push the boat moves sideways—and does not rotate in any way.

On most sailboats with longish keels this is somewhere around the middle of keel. Fin keel yachts, with offset spade or skeg hung rudders will find this point toward the after end of the keel.

The same factors which affect your sailing efficiency and steering control under windvane or autopilot also affect your turning radius.

The shallower/lighter the hull, shorter the keel and further aft the rudder, the quicker the boat will turn.

Spade rudders will turn a boat faster than a skeg-hung rudder, which in turn is better than a keel-attached rudder.

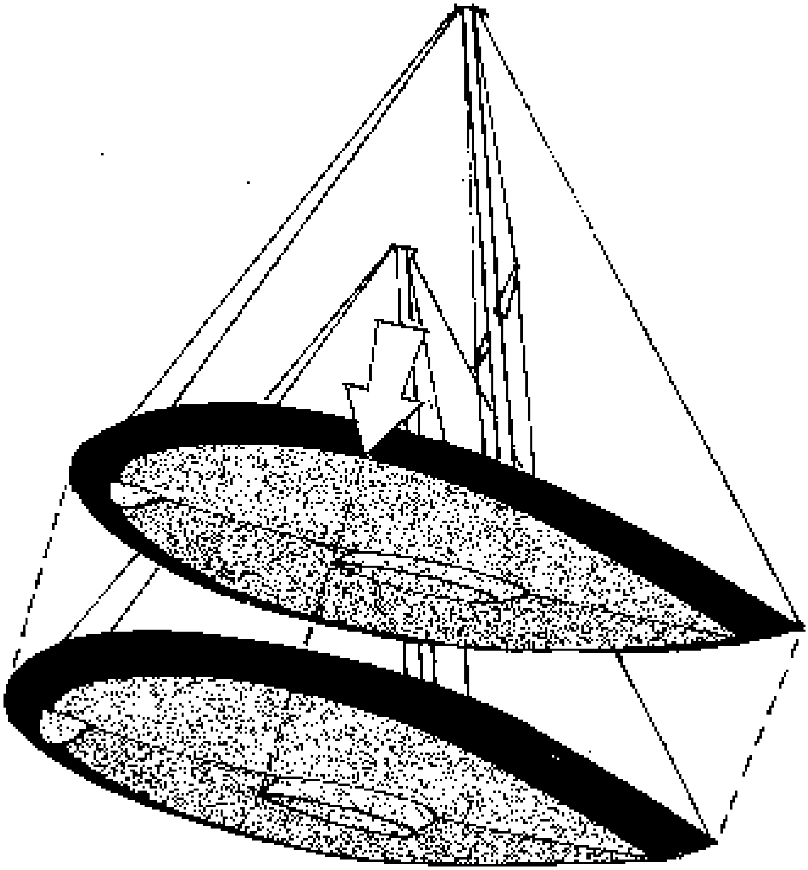
Some yachts exhibit a tendency to oversteer when powering ahead at significant speeds. This happens only on rudders with counterbalanced areas ahead of the stock in the slip stream of the propeller.

The prop wash provides too much counterbalance and as the rudder turns this gets worse.

As with steering in reverse this is a function of boat speed, engine rpm, and rudder angle.

If this does happen sometimes the only thing you can do to unload the rudder is to reduce engine rpms.

The center of lateral resistance (CLR) is that point on the hull where if you push sideways the boat does not turn one way or the other—it just goes sideways, directly away from you. This is a function of heel, rudder, and hull shape.



You can determine this on a calm day by pushing on your topsides. If you are forward of the CLR the bow will turn out so you need to move aft. If you are aft of the CLR the stern will move away from you and you need to move forward.

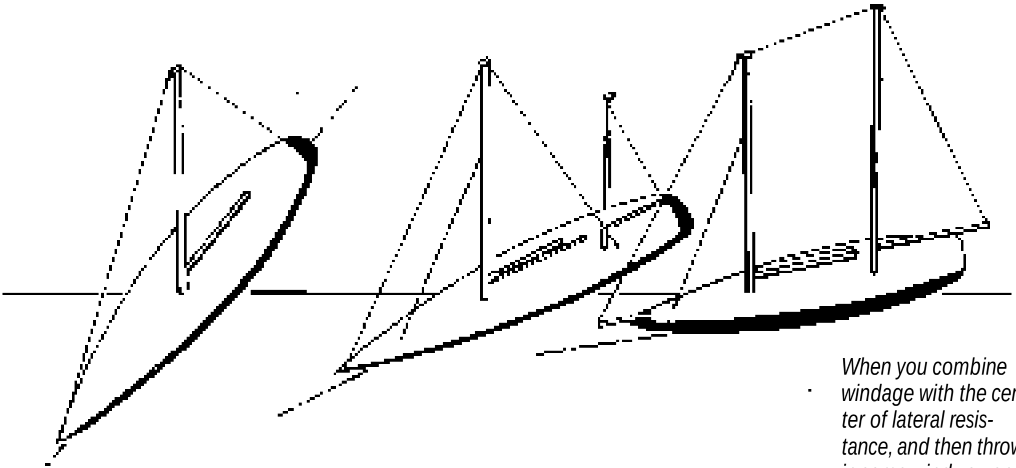
Sideways Drift

It is important to know the sideways drift rate in different wind speeds and the drift angle. Almost all single-stick sailboats drift with their bows angled to leeward 30- to 40-degrees. This angle is reduced if you get rid of roller-furling headsails.

Ketches with large mizzens (like *Beowulf*) and schooners are more nearly even in their beam on drift angle with usually a modest ten degrees or so of bow down angle.

Sideways drift will vary with wind velocity, the wind gradient (how much more wind their is aloft than at water level) and with any waves that may exist.

The pressure from waves can have more of an influence in some conditions than the wind.



When you combine windage with the center of lateral resistance, and then throw in some wind you end up with a natural drift angle to leeward. Single-stickers will end up the most bow down (away from the wind). Ketches and yawls fall somewhere in between and schooners lie the closest to the wind due to their great amount of windage well aft. Note: roller-furling has a huge influence on windage.

Downwind Drift Rate

When the boat is turned downwind the drift rate will pick up in speed. You may be able to hold the boat on station with short, soft bursts of power. Experiment in various wind strengths to see how much power is needed in different wind velocities. There may be problems with stern walk (see below) and some compensation may have to be made to keep your track straight.

Most boats can be steered downwind without sail and maintain a course of 20- to 30-degrees off dead downwind. It is important to determine how high an angle you can hold, and at what angle the sideways component kicks in.

Head-to-Wind Station Holding

Head-to-wind station holding is important in some tight situations. This ability varies with wind velocity and design type. In almost all designs, at some wind strength the boat will stay relatively stable in direction with just a tiny amount of power.

As the breeze increases more power and speed need to be used to maintain a head-to-wind angle.

If you are running out of room ahead, it becomes critical to know the minimum speed you need to hold your head upwind.

Check the minimum speed in a variety of situations necessary to maintain steering control (by steering control we mean a speed where the boat responds with some alacrity to the helm).

This minimum speed will be different for different headings. Upwind and downwind will be slowest, while wind on the beam will take the most speed.

Stern Walk

All propellers exhibit a certain amount of sideways thrust. It is there when you are going forward as well as astern. The difference is that when you are headed forward there are some offsetting factors which keep the affects to a minimum.

When you start up astern, however, in many yachts the stern torque takes over and you end up going sideways, whether you want to or not.

However, in most cases there are ways of dealing with stern torque (which we'll deal with shortly). And, it is a decided advantage in many maneuvering situations.

All of what we've been talking about so far comes together in the drawing below. When the time comes to avoid an obstruction in the water, or maybe a docked vessel, how turning radius, pivot point, prop and rudder, and prop torque combine determines what you can get away with, and what turns into an embarrassing incident.

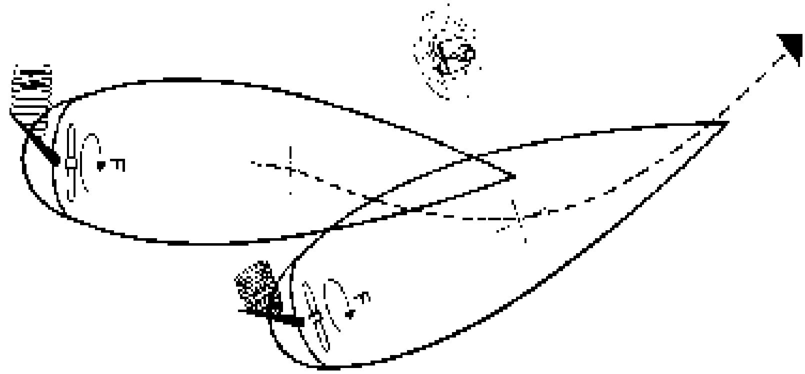
In the top drawing we are maneuvering to avoid an obstruction in the water. The helm is turned towards the obstruction once the boat is abeam. This rotates the stern out from the center of the turn, and away from the obstruction.

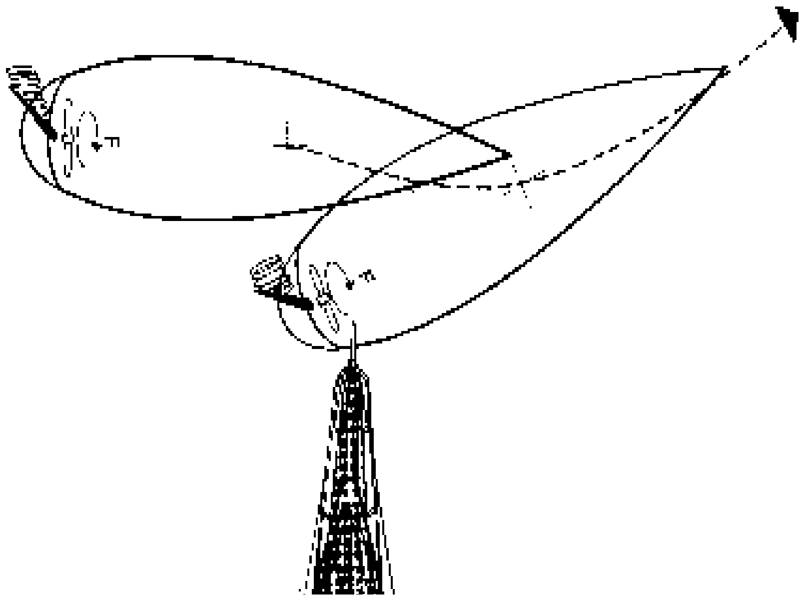
The lower drawing shows what happens when this is tried with an obstruction on the outside of the turn. Once again the stern kicks out and now into the bowsprit of the moored vessel. In this situation it is better to make no turn, or turn to the right, to swing the stern away from the bowsprit.

The majority of boats "walk" to port in reverse. A few, with counterclockwise rotating propellers will walk to starboard, but this is unusual.

In order to learn how to deal with stern torque we need to quantify its characteristics. To do this here are a series of experiments to try. It may help to go down this list and make some notes on how each experiment turns out.

The key thing we are looking forward is how to get the boat accelerated enough so that the water flow over the rudder and keel are sufficient to keep the boat tracking straight.





Help

As the acceleration takes place over time, when you initially begin reversing there is little speed on with which to keep the boat going straight. So, she is going to head off to the side (usually port) regardless of what you do. What we want to do is quantify the amount of offset to the side, and find out how much distance you need to travel until you are going straight.

Start with the bow headed dead downwind, with the boat at rest. Then try starting in reverse, with the helm centered, at minimum rpm.

This is the configuration in which you have the best chance of keeping the boat straight, as the wind is helping to keep your bow off the wind.

Do not apply rudder to offset stern torque until you have a knot or so of sternway. Try different rpm settings (dead slow almost always works best). Next, try different boat speeds before putting in counter rudder to offset any turning tendency. Keep in mind that most of the time starting off with counter rudder does not work and only makes the turning walk of the stern worse.

If it seems to be taking a very long time before you head straight, or if you just go in a circle regardless of what you try, start the sequence with the stern pointed off the wind in the direction opposite stern walk. If your walk is to port, have the wind coming over the port quarter. This uses the wind pressure to offset stern torque until you have enough speed to allow the rudder and keel to take over. We have seen boats where it is necessary to start with the wind as much as 45-degrees off center in order to end up going dead upwind in reverse

How Fast Can You Stop?

One of the major considerations in maneuvering under power is how quickly you can stop your forward way. To find the bottom line, try running ahead at various speeds or rpms. Then with different amounts of reverse, note how many boat lengths it takes to come to a full stop. If your boat has a folding prop, the distance may be considerable, but a good-sized three-bladed prop or reversing-pitch prop can stop most vessels in five to ten lengths.

Your ability to stop controls how fast you can maneuver in forward gear. Since the faster you go in forward the better steering control you have, within reason, you usually use as much forward speed as possible.

A part of this equation is what happens to the stern when you go into reverse. Stern torque is going to play a part and at some point you will find that the stern is starting to swing even though you have not stopped all forward momentum.

Generally speaking, the less reverse thrust used to stop, the less stern walk affect there will be.

One trick that works well with a headwind is to turn the bow in the same direction of stern walk just before you drop into reverse. This means that with port walk you turn the bow to port. The wind and stern torque then fight it out, and if you have the right angle, the boat ends up straight!

What to check:

- ❑ Turning radius at various speeds.
- ❑ Direction of stern "walk" in reverse.
- ❑ Distance of stern walk in reverse at different initial engine rpms.
- ❑ Amount of angular offset needed on heading to compensate for stern walk when stopping from various speeds.
- ❑ Drift rate in different wind strengths.
- ❑ Position of center of lateral resistance.
- ❑ Minimum speed necessary for rudder control in different winds.
- ❑ Stern kick-out when turning.
- ❑ Distance required to stop from various speeds, in different wind strengths.
- ❑ Amount of offset of stern torque when stopping.

Techniques Under Power

One rarely finds exactly the same mix of wind, current, space, and boat capabilities repeated. So the maneuvering techniques we are about to review need to be looked at with a grain of salt. They will rarely work out exactly as we describe them.

On the other hand, if you understand the basic capabilities of your vessel, and then know the theoretical uses to which these can be put, you can improvise in each situation.

Rotating

Rotating with stern torque:

- ❏ Allow room to leeward for drift due to wind.
- ❏ Put bow off the wind, in direction of turn (i.e. keep the wind on port side for boats whose sterns kick to port).
- ❏ Have helm hard over in opposite direction of stern torque (helm to starboard on most boats).
- ❏ Use forward thrust on engine until boat starts to move forward.
- ❏ Switch to reverse thrust for as long as stern displaces. Then switch back to forward.
- ❏ Avoid fighting the wind. Always turn away from the wind, rather than into the wind. Most boats will not generate enough thrust to come into more than four or five knots of breeze.

The tendency for the stern to torque sideways or walk as we've been describing it is a pain when you are trying to back up. However, it is a wonderful tool when you are trying to turn around in a tight spot.

We had sailed three-quarters of the way around the world when we first observed what we are now going to relate to you.

We were docked in a narrow waterway in Fort Lauderdale, Florida. The channel was at the most 75 feet (23 meters) wide between the boats moored on either side.

The breeze was blowing straight out of the north, which in this case meant down the channel towards the New River.

A Bowman 57 (a mid-70s late CCA early IOR design) came slowly up the channel. As there were no open docks I wondered where this fellow was going. I was even more curious as to how he was going to extricate himself when he realized he was in a dead end channel.

As the Bowman 57 came abreast of *Intermezzo II* the skipper hailed us. "I am looking for 14th street. Am I in the right place?"

"No," we answered. "It is the next channel east of here. Would you like to raft alongside and then we can get you turned around?"

"No thanks, I'll just rotate myself with the prop." This we had to see.

He worked the boat a little further down the channel and then moved over a few feet to the east so that he was just past centerline. He then put the engine into reverse and gave a burst of power. There was a puff of black smoke, and a boil of water, and the stern almost jumped to port.

Then he put the helm hard to starboard and gave a shot forward. The bow spurted around clockwise continuing the turn the reverse thrust has started.

The process was repeated over and over again—short bursts of reverse followed by forward, with the rudder left hard over.

Gradually the boat pirouetted 180-degrees and then slowly came back along side. "Thanks for the offer of help," was the skipper's comment.

We never learned his name, but could not get the maneuver out of our minds. It seemed like magic, turning that Bowman 57 in such a tight space.

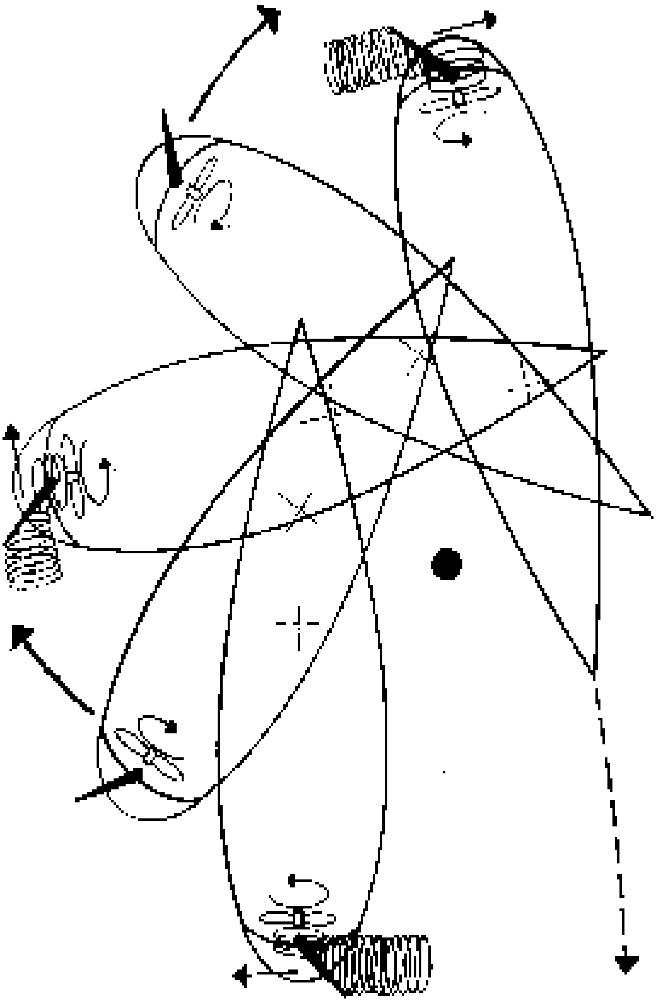
A few days later we were in Charlie's Locker, the local marine hardware store when we spotted the skipper of the Bowman.

Help

We went over, introduced ourselves, and learned that Charlie Blake was a professional delivery skipper from the UK. He was in Florida to pick up the Bowman and bring her to the West Indies for the winter.

We could not resist asking him what it was he was doing under power.

The answer was astonishingly simple. "Reversing the engine makes the stern go to port, especially if I give her a good shot of power. I then shift into forward and the thrust of the prop is deflected by rudder to starboard, shoving the stern to port again. Then back to reverse, and forward, over and over until we have turned the bow to the desired heading. It is really very simple."



Here's an aggressive approach using rudder direction change and thrust to rotate. We start at the bottom, with the helm hard over to starboard, with a thrust in forward. This shoves the stern to port. The helm is then quickly switched to port and a shot in reverse is given. The stern torque plus some rudder action jumps the stern to port, continuing the turn. The process is repeated, forward and reverse, until the correct angle of turn is achieved. Note: turning the helm back and forth only works with boats which have fast acting rudder ratios, and in relatively calm winds (so drift to leeward is not a problem).

This was a revelation and a few days later, when we were heading out for a day sail we gave it a try on *Intermezzo II*. It worked like a charm. In very short order we had spun around 180 degrees in little more space than our overall length.

Since that day many years ago we have used this technique hundreds of times to turn ourselves around tight right angle corners or rotate 180 degrees to get out of a tight spot.

To recap: put the helm hard over in the opposite direction of stern torque (on most boats this means turning the helm to starboard to continue the turn of the stern torque as it lifts the stern to port), give a strong pulse of power in reverse, then switch to a comparable pulse forward. Repeat as needed until the perquisite angle is obtained.

A few caveats are in order. First, keep power on in each direction as long as lateral

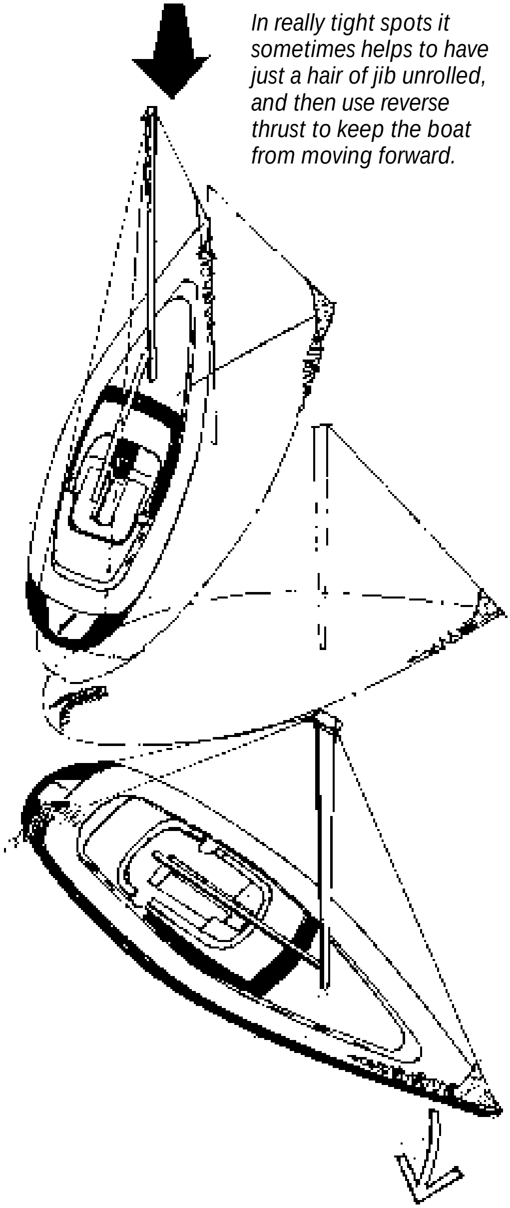
Help

The wind can be extremely helpful when turning in tight quarters. Put the bow on the opposite side of stern torque relative to the wind (typically have the wind on the port side).

displacement is taking place. When the turning action becomes forward or aft motion, change the direction of propeller thrust (usually this is about two to three seconds tops).

Next, allow a second or two for the rpms on the diesel to drop back to idle before shifting. This is especially critical with Max props which otherwise slam their blades back and forth putting a lot of stress on the transmission and engine pressure plate.

The above not withstanding, the faster the shifting takes place, the tighter will be the turning circle.



In really tight spots it sometimes helps to have just a hair of jib unrolled, and then use reverse thrust to keep the boat from moving forward.

If there is wind or current exacerbating a space problem, you may need to reduce the time allowed for the engine to slow back to idle.

Do not try to fight the wind. If your bow is downwind, and there is more than four to six knots of breeze, it may be very difficult to get the boat to rotate against the wind. If you are heading upwind, set the bow off at an angle to the breeze so that it helps blow it to leeward while the prop is pulling to windward.

The higher the rpm (and the more horsepower going into the water) the more rotational energy there will be. However, it is best to finesse this maneuver with minimum necessary bursts of engine rather than using brute force (which is hard on the drive train).

Keep in mind that any breeze will tend to push you downwind while the rotation is taking place. If space is tight to leeward, other tactics may have to be used.

Never try to rotate or turn against the direction of stern torque if you are in a tight space. The best you can hope for is a large diameter circle going ahead.

Using the Wind to Turn

As we've just been discussing the wind can be a help or a hindrance. Unless you have a powerful thruster, or a really efficient engine/prop/rudder setup, you will not be able to turn your bow against any sort of a breeze.

On the other hand, the breeze can be a big help. Using it to blow the bow down while you hold position with judicious small bursts of power is a time-honored practice.

Once again, however, you need to have room to leeward in which to drift while this process is taking place.

If torquing the stern is not an option for some reason, unrolling a small bit of jib, and then holding the boat back with the engine, will shorten the time and distance the wind needs to get your bow headed downwind.

Backwards

Most modern yachts will back down with some degree of authority, if coaxed in the right manner.

The key factor is (surprise) stern torque. The more of this there is, the tougher your job is going to be until you get some way on and get the fins working.

The yachts we sail on today back up straight as an arrow. But that has not always been the case.

If there is a significant tendency to circle for awhile you can sometimes offset this by aligning the hull away from the torquing direction; i.e. aiming the stern somewhat to starboard of your intended track. This way by the time the boat has started to go straight it will be pointing in the right direction.

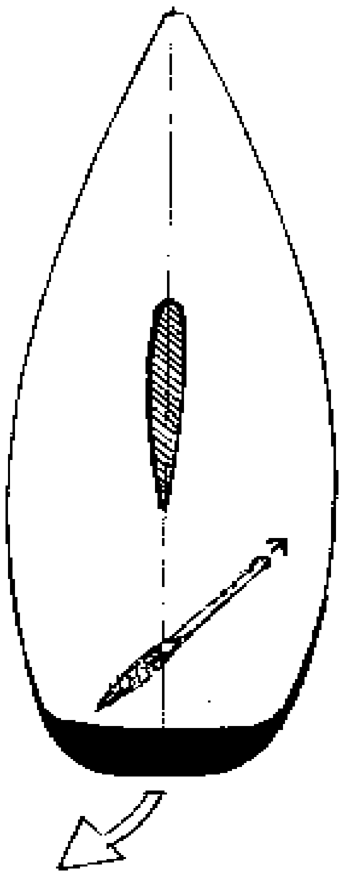
If your direction is abeam of the wind, try to position yourself so the wind is against stern torque (typically on the port side).

It is worth repeating that this process of backing up is better done heading into the wind, where the breeze can hold the bow downwind.

Steering in Reverse

Steering in reverse is most easily accomplished by standing at the wheel facing aft. In this manner, you simply turn the wheel the direction you want to go.

As long as you are moving slowly the steering loads are moderate. But as speed increases towards three or more knots, steering loads will increase geometrically with helm angle. The more the rudder blade is turned the more force there is to turn it further, until the point is reached where it may not be possible to hang on. The rudder then slams against the stops with a horrendous bang, after which all sorts of bad structural things can occur.

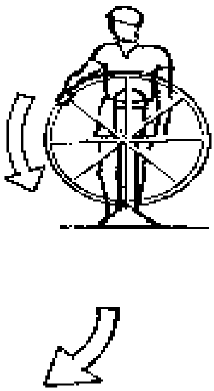


While reverse thrust is always asymmetric, i.e. biased in one direction, deflecting forward thrust to the side works well to port or starboard. This is important to remember if you need to swing the stern away from something, or bring it towards the dock.

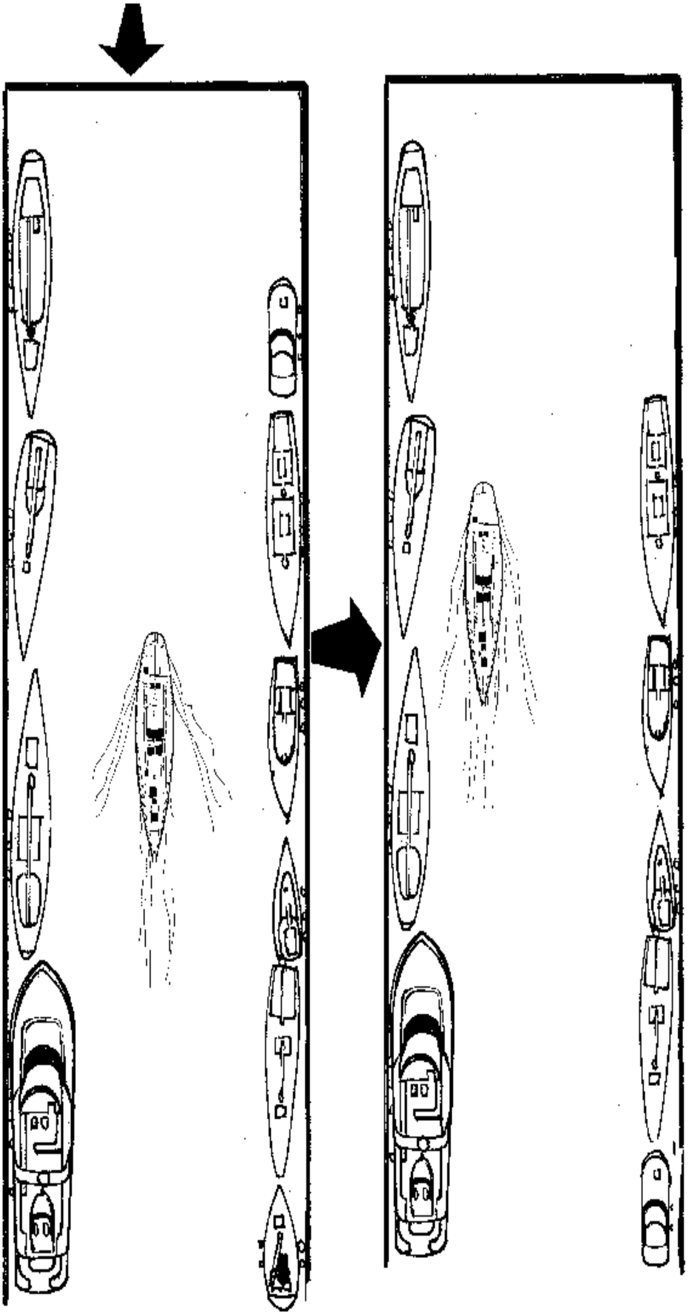
The natural tendency of the stern to slide out in a turn is accentuated when the rudder is hard over and you give the prop a short burst of power. You see the same thing if the boat is moving slowly or stopped, only the sideways displacement is not as significant.

Steering in reverse is simple if you face aft when at the wheel. Then, just turn the wheel in the direction you want to go.

Another way to think about this is to point the trailing edge of the rudder in the direction you want to go (when reversing).



Help



In tight channels it is always better to back in, especially if this is against the wind. The breeze helps keep the bow downwind, and if you need to exit a turn is not required.

When the wind is on the beam (right drawing) bias your course to the windward side of the channel. This allows some room for drift to leeward, and if you start to get out of position, you can change direction. exit the channel, and then try again.

If the wheel gets out of control with a combination of too much speed and too much rudder angle it poses a significant hazard to your limbs. Note that the point of being overpowered is very much a function of the strength of the person on the helm. The weaker the helmsperson the more careful with this you need to be.

Never put your hands or allow anyone else to put their hands *through* the spokes of the wheel. If the wheel spins you/they can be hurt!

So, go as slowly as possible in reverse, and minimize the amount of helm deflection.

If you are facing forward while going in reverse it will sometimes become confusing as to which direction to turn the wheel. If you remember that the stern turns just like the bow when you turn the wheel, you will stay out of trouble. In other words turn the wheel to starboard to get the bow or stern to go starboard.

Tight Channels

If you have reasonable control in reverse it is almost always better to back into a tight channel. This way you have the option of exiting in forward gear, if you find yourself in difficulty.

Also, going in stern-first gives you a much better view from the helm.

Help

Another consideration in tight spots is staying away from the leeward side of the channel. If you are to weather you have room to maneuver if something goes wrong, before the breeze has you pinned against the leeward side.

If you do get pinned to leeward put out some fenders and wait. Do not try to power forward or in reverse as this will only drag you more along whatever you are stuck against.

It is better to temporarily secure the boat, and then get a breast anchor set so that you can winch yourself back into mid-channel.

Practice

We've been throwing around a lot of data on handling under power. It would not be surprising if you were a little overwhelmed by it all. After all, most sailors spend their time practicing sailing, not powering. The engine is typically a secondary consideration.

Our own experience, however, is that handling a boat under power can be a lot more difficult than under sail.

The way around this is practice. And it doesn't take a lot of time. Just fifteen minutes a day, whenever you go sailing, trying out different techniques on your own (where you won't be embarrassed by the results) will some day pay huge dividends!

Pre-Planning

As you begin to get familiar with these powering techniques at some point many of the principles will become second nature. In most maneuvering situations you will go in, check out the space, make your decisions and do what is necessary.

We find that 90-percent of the time the whole thing is automatic.

However, from time to time we are faced with a situation which could prove embarrassing or expensive if things go wrong. If this is the case we sit down for a couple of minutes and try to pre-plan a course of action. In the process we'll review all of the things which could start to go wrong and what our reaction, to extricate ourselves, should be.

If we've been away from the boat for awhile and are rusty, or we are just finishing a long passage and we're tired, we feel more comfortable making a quick diagram of the options.

In the process we discuss going in bow- or stern-first, which direction we'll rotate if required, and if it is necessary to have an anchor ready to go. If we need an anchor, then by definition we probably need the dink ready to launch as well.

We always like to have an escape route if things do not go right. Perhaps a gust of wind will catch us, or another boat unwittingly gets in the way.

We always try to avoid situations where there is only one try—if you miss you are then shot down.

Last, we ask ourselves is this *really* necessary? If we are tired or the weather is marginal, why not anchor out until things improve? Whenever we're in doubt this is the choice we make.

The greatest challenges with tieing up will be found in areas with swift currents, lots of wind, or large tidal ranges.

You will find all three combined if you cruise in Alaska (Ketchikan, Alaska shown right).

Stanley Dashew

Preparing to Dock

An integral part of docking maneuvers is having the right docklines ready to go, and knowing how to use them to best advantage.

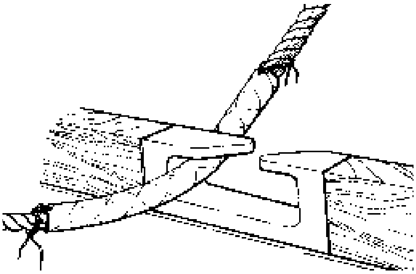
Types of Docklines

Docklines need to have some shock absorbing capacity, so nylon is typically used. It is important that the line is soft, and has a nice feel, and does not tend towards twists or hockles. Our own preference is a plait construction, followed by dual braid. Three strand is our last choice.

The size of docklines depends on the loading you expect and the risks from chafe. There is also an issue with weight and handling as yachts get larger. In most cases, we use the same size docklines as are employed for anchoring.

However, on larger yachts it frequently makes sense to use a lighter line for the actual docking maneuver, and then switch to the heavy stuff once the boat is secure.

Alternately, a lightweight messenger line can be heaved across and then the heavy docklines pulled ashore.



If you are leaving the boat for a long period, or where surge is a problem or strong winds expected, some form of chafing gear should be used. Split hose is okay for general use. However, in really difficult situations using split fire hose or wraps of heavy canvas or dacron works better (the hose retains heat which weakens nylon).

Rigging

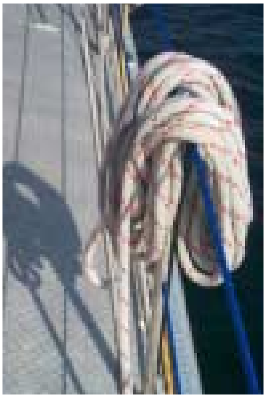
Docklines need a fair lead from where they are secured aboard through a chock or hawse and then ashore. They need to be clear of lifelines and running rigging.

We find that it works best to start with the bitter end of the coil, and then pull it through whatever fairlead is being used to where it is being secured.

With the bitter end cleated or bent around a winch we then coil down the throwing end, making sure, of course, that the line runs outside of the lifelines before we bring it back aboard in preparation for throwing it ashore.

Docklines need to have lots of extra length so that there is plenty of line if the boat is further away from the dock than you first anticipated when you start to tie up.

Help



We leave all our docklines coiled and ready to throw, typically hanging over the lifelines. This way whomever is doing the throwing can quickly get each line ashore. We also keep one or two spare lines ready, in case something unexpected develops.

Throwing docklines properly takes practice. For longer lines it is usually best to divide the line into two coils. Throw the first coil flat, like you are skipping a stone on the water. Allow the second coil to feed out of your other hand as required.

Throwing Techniques

Lines should be thrown flat, like you were skipping a stone across the water. A wide swing, using the twisting action of your body to rotate your extended arm works best.

It may sound a little silly, but practicing the tossing of docklines can save a lot of trouble when the adrenaline is pumping!

There is a limit to how much line can be thrown at once. This will vary with the weight of the line and to some degree, how soft a construction is used in the line.

When the coil gets too large it helps to break it into a primary and secondary coil. You throw the first coil, and then momentum takes the line off your other hand.

Rather than throwing the line directly towards someone, we find it works better to throw the line *past* the dockside helper.

Cleats or Winches?

Where initial docking loads are light, lines can be run to handy cleats, making sure, of course that the lead is fair and there is chafe protection for the line where it leaves the boat and heads for the dock.

However, if the docking loads are at all high, it is best to find a way to get the lines to a winch, either on the mast (via a snatch block at the mast base), a primary aft, or a powered windlass.

The winches give you the ability to use the geared leverage to pull yourself into position.

Proper Cleating

Lines should be led on a cleat using the most acute angle, i.e. the one with the best angle around the base. The line should then be wrapped back and forth in normal fashion. Docklines should never be locked off with half-hitches, except for the very last wrap. If half-hitches are used where they will take load, they become very tight and difficult to remove.

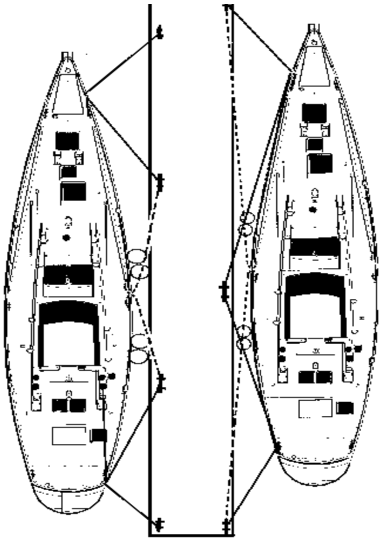
Rather than a half-hitch at the end, our preference it to take a final turn around the base of the cleat.

When line loads are going to have to be bled off on the cleat the number of wraps will need to be reduced. How many wraps can only be discerned with experience. It varies with the shape and smoothness of the cleat, the finish on the surface of the line, and the loads on the line. We typically use one-and-a-half wraps.

Flat cleats will have more friction than round cleats. Galvanized are tighter gripping than polished stainless or bronze.

Wet line often has more friction than dry.

Using a series of half-hitches (left) on a cleat will make the line difficult or impossible to release if it has been under load as the half hitches lock onto themselves. A better approach (right) is to use a half-hitches on just the last wrap to lock the cleat.



How spring lines are rigged depends on placement of cleats on the dock, and those on the boat. If the springs are just to keep the boat from surging, after docking is completed, they can be rigged almost anywhere. However, if they are to be used to slow or stop the boat, then they should be rigged at as flat an angle as possible, typically attached somewhere near the middle of the boat (dashed lines).

Bow and Stern Lines

Bow and stern lines are used to position the boat alongside the dock. They do not work well for stopping the boat (the job of the spring lines). In fact, if someone tries to use a bow or stern line to stop forward or aft motion it usually results in pulling that end into the dock and making the rest of the maneuver more difficult.

When we specify docklines for the yachts we design we usually figure that the bow and stern lines should be at least 45 feet (14 meters) long, or 80-percent of the vessel's length, whichever is longer.

Bow and stern lines can be shorter than this for your everyday marina, but when you are heading into strange places you need some additional line length on hand for the unexpected.

Spring Lines

In the initial docking maneuver spring lines are typically used to stop forward or aft motion or to bring the boat into (or away from) the dock. Once the boat is secure, they keep you from surging back and forth with wind, current, or wakes.

We like spring lines to be at least the length of the boat, but no shorter than 60 feet (18 meters). We usually specify the springs out of the same material as the anchor rode for convenience sake when purchasing. However, they can be one size smaller in many situations.

The location at which the spring line first comes aboard determines how it works.

Midship spring lines will tend to keep you parallel with the dock while those which go to the bow will pull the bow in and stern out. The opposite applies to a spring on the stern. It tends to pull the stern line in and push the bow out.

In most cases, midship springs are what you use, at least for coming alongside the dock.

Breast Line

There are some situations where you want to be able to partially control the boat from shore, but don't want or can't get the requisite three or four lines handled quickly enough.

If you take a single breast line ashore from the center of lateral resistance, you can use this single line to warp yourself alongside.

We always lead our breast line to one of our primary winches in the cockpit. Once it is ashore, we know everything is under control.

Help

The engine can be used to nudge the boat forward or aft while your grind away on the winch. If you have electric winches, this makes the docking chores really easy.

We have been in docking situations in Alaska with very tight spaces, lots of wind and current, and no assistance ashore. By using a really long breast line (typically 150 feet/46 meters), there is lots of room and/or time for one of us to take the line ashore in the dinghy.

Line Handlers Ashore

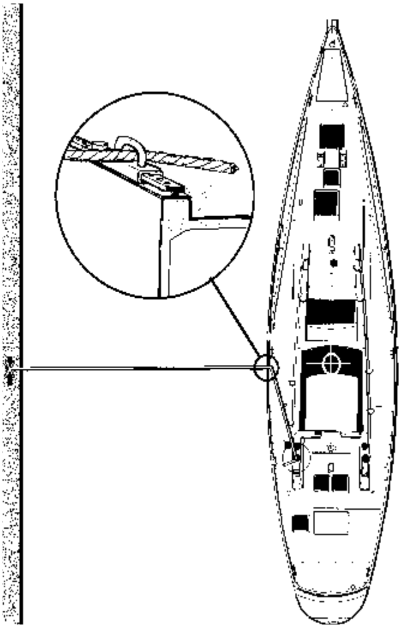
A major concern of ours is the experience of the line handlers ashore. If we are docking with a lot of wind or current, where we cannot afford a mistake on the dock, one of us (or an extra crewmember whom we trust) will go ashore from the stern swimstep, or we use the dinghy.

This way we are certain that the lines will be properly secured the first time.

You will want to decide in advance which line goes to which cleat on the dock, and then communicate this clearly with the line handlers.

Our experience is that many times the folks on shore think they can just hold onto the docklines, or maybe pull us in. Obviously this is not going to work with a large yacht, and it won't do with a small vessel if there's any wind around.

It is important that the shore crew gets a couple of wraps on the cleats right from the start.



The breast line is typically rigged on the center of lateral resistance, so that it pulls you straight into the dock. This is usually somewhere towards the trailing edge of a fin keel and about 40-percent of the way from the stern to the bow on full keelers (experiment to find the right spot).

The breast line is then led to a cockpit primary winch. If you can get close enough to throw it, great. Otherwise, if often makes sense to put someone on the dinghy and have them take it ashore—especially when you are not sure of the shore-based line handler's skills.

Which Lines First?

You need to be clear in your own mind what order the lines are to go ashore, and this needs to be communicated to the crew.

Since we normally use a breast line (which also doubles as a bow or stern spring) this is always the first line onto the dock.

The next line is determined by whether we want to control the bow or stern first.

Finally, with breast, bow and stern lines ashore we'll set up the spring lines.

Controlling Lines under Load

Ideally you will be able to use the engine to stop your momentum, so the docklines see minimal loading.

However, this is not always possible. If a spring line is being used to stop the boat remember that you have a lot of mass moving and that a substantial quantity of force is involved.

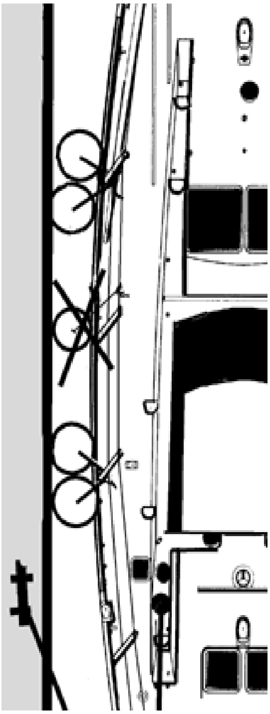
Rather than snubbing off the spring line it needs to be bled off, allowing the boat to decelerate gradually over a few seconds.

We find it is always best to try to make the job of the line handlers ashore as easy as possible. Towards this end:

- ❏ Tie large bowlines in the ends of docklines so they can be dropped over pilings or cleats.
- ❏ In some cases a snap-shackle may be of value to speed tieing (if there is a rail to secure to rather than a cleat). However, take care when throwing this to miss the folks on the dock!

Fenders should be balanced so they share the load. This usually means having them ahead and behind the point of max beam. If you have one at the widest point, it carries a higher percentage of the total load.

Often it makes sense to double up the fenders (as shown here) rather than spreading them out as this keeps the load more evenly distributed.



Fenders

Fenders should be secured to stanchion bases, cleats, or other deck hardware. They should not be tied to lifelines as the flexing load eventually will cause the lifeline wire to fail.

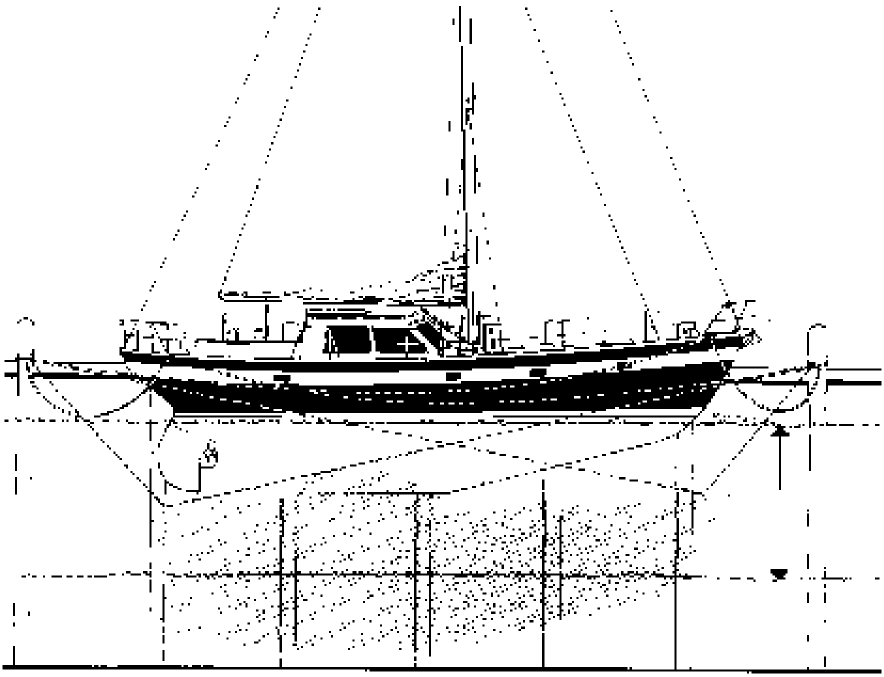
Experience will tell where the best position is for your fenders. If you have midship springs or a breast line, and pulling the ends into the dock is not a concern, then the fenders can be concentrated around the middle of the boat.

However, if the risk of pulling bow or stern into the dock exists, then fenders will need to be spread out a bit more.

It is best to have the fenders arranged either side of the point of maximum beam, so that the load is spread between several places.

Using fenders with pilings is problematical. Here the best bet is a rubbing strake down the cap rail or topsides. If you don't have a strake, then the next best bet is some form of fender boards. These can be made from a two-by-six piece of timber set over a couple of fenders. However, if you are spending much time with pilings a fender board with its own bolted-on fendering material is best, as loose fenders tend to roll out from behind the boards.

Anchoring to a fixed dock where there is a substantial tidal range can be a challenge. Aside from periodically adjusting the docklines, having really long lines, with lots of angle, will mitigate the effects of the tide tightening and loosening the docklines.



Help

DOCKING

The approach to docking varies with the dock in question, current and wind, the space available in which you can maneuver, and what escape routes (if any) are available if things start to go wrong.

Stern Torque

A primary concern in deciding how to approach the dock is the direction of your stern torque. Do you want it to pull you onto the dock, or save it for getting off later?

For most boats approaching the dock bow first with some way on, the stern is going to pull to port when you put the engine into reverse. If you are coming in port side to, with the bow angled in, stern torque will straighten you out nicely.

The key is balancing forward speed and the angle to the dock with the reverse thrust required to stop the boat and the resulting change in angle.

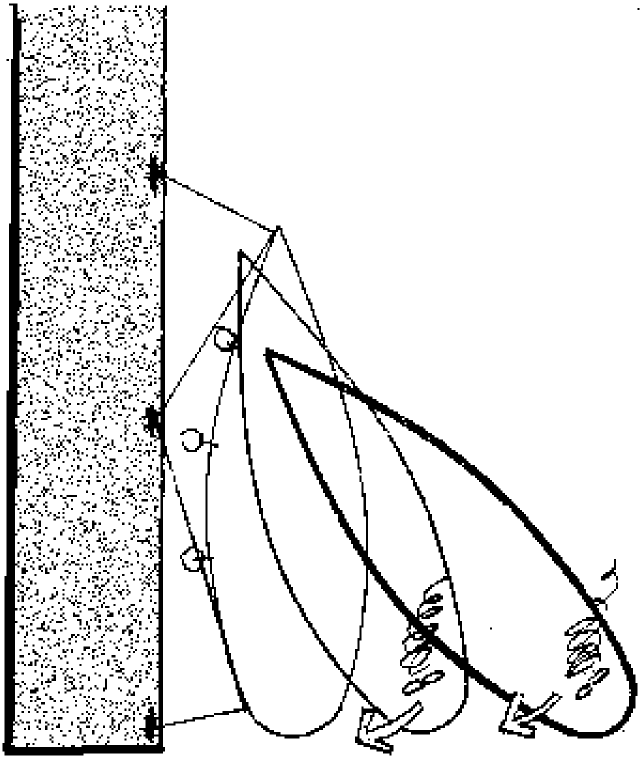
Now look at this from the opposite side. Say you are coming in starboard-side-to. When you hit reverse it is going to pull the stern *away* from the dock.

In this case, you need to be nosing in at a slower speed so less reverse and the resulting displacement to port occurs.

If you don't need to use the torque to swing you alongside, as a general rule it is best to bring the starboard side to the dock. This keeps stern torque in reserve to pull you off the dock when the time comes to depart.

When we first left California we would have anchored out rather than try to maneuver Intermezzo in such a tight spot. But by the time we got to Auckland, New Zealand, in 1977, we had a pretty good feel for what we could, and could not get away with.

A spot like Marsden's Wharf, in downtown Auckland, was okay as long as the breeze was light when we were entering or leaving.



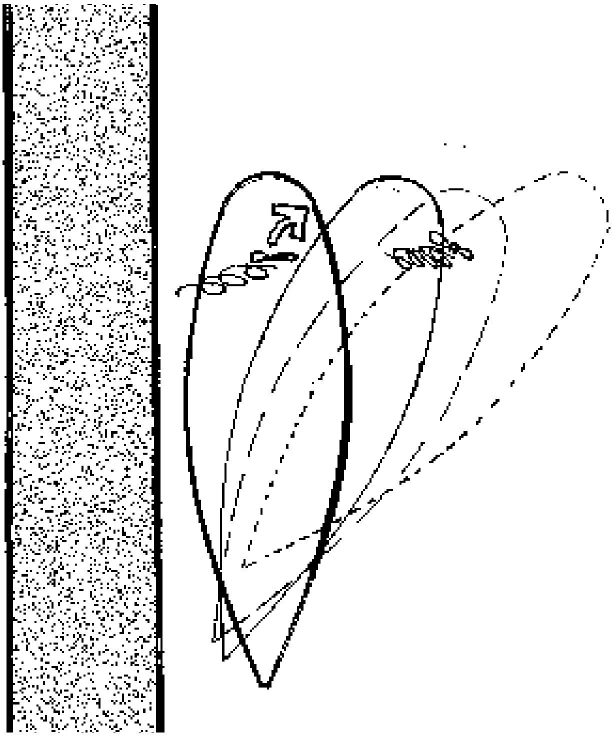
Normally is it easiest to get onto a dock using stern torque to pull you against it.

In this drawing the boat is heading in at a significant angle with a couple of knots of way on.

When it is time to bring the boat to a halt, a strong burst of reverse is applied. This both stops the boat, and swings the stern against the dock, with the boat ending up parallel if the initial angle is correct.

Note that the faster you are going ahead, the more reverse will be required to stop, and an increased initial angle will be required.

The problem comes when it is time to leave. Now the stern torque is trying to hold you against the dock.



Often the wind will help by pushing you onto the dock. In this case, the boat can brought in on the side opposite stern torque, as shown here.

This way, when the time comes to leave, the stern torque will help pull the boat off the dock.

When using spring lines there is often a 15- to 20-degree difference in the angle which can be achieved, depending on whether the stern torque is helping or hindering you.

Bow or Stern First?

For most yachts there is no choice but to head into the dock bow first. There simply is not good enough control to back in.

But on many modern yachts one has good control in reverse, so backing in becomes an option.

There are several advantages to this backwards approach. The first, as we mentioned in an earlier section is that you have a better view of the dock coming as you are right on top of the action. Next, if you decide to abort and go around for another try, it is usually easier doing this going ahead.

Finally, it is more fun and tends to shock the locals if they are not familiar with your capabilities in reverse.

The perfect time to use a breast line is when the docking spot is tight, and the wind isn't helping push you on the dock.

The breast line controls lateral movement, while the longitudinal position is coordinated with forward and reverse on the engine. This works best if there is a bit of wind or current to work against.

Wind Pushing On

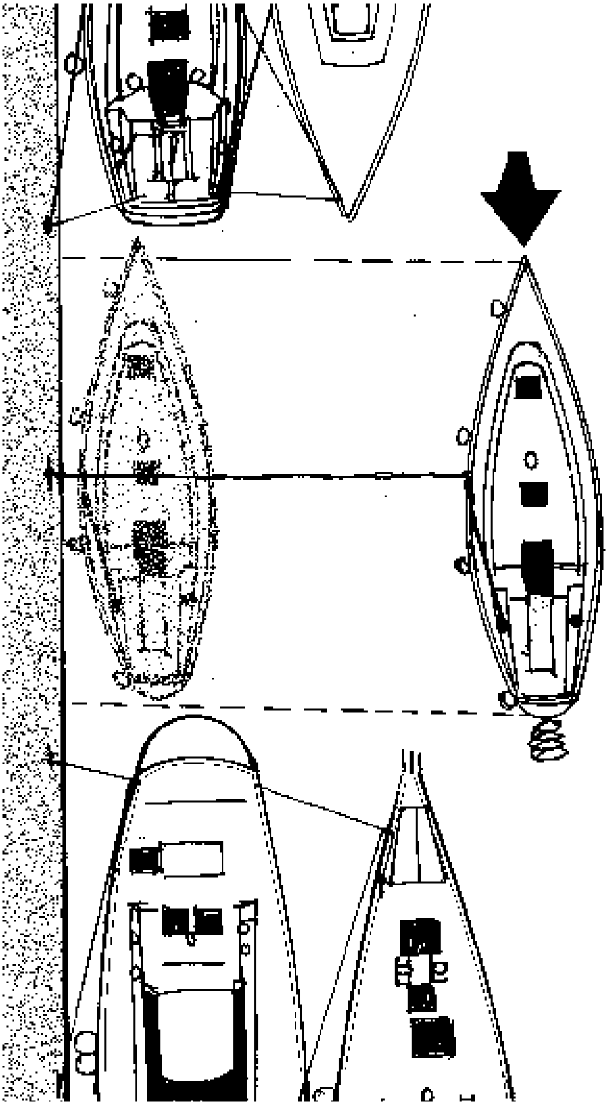
If your berth is downwind and the wind is abeam the wind will not only drift you down onto the dock, but will hold you there. As long as everything goes smoothly this is fine. But remember there is no escape if the docking scenario starts to deteriorate.

One way to approach this situation is to come alongside a boat length or so to windward, and then stop. If the dock is on the port side the stern torque will pull the stern towards the dock as you reverse, pushing the bow into the wind a bit.

Then, as you drift down since the bow will drift to leeward faster than the stern and the stern torque can be used to even things out.

If the bow begins to fall off too far you can sometimes get it back up to windward a bit with a short, hard burst of reverse.

Docklines should be used first to offset any current, and then to keep the boat parallel. With the wind on the beam this usually means getting the stern line on first.



Help

If conditions are really difficult—due to lack of space, wind, or current-using bow and stern breast lines gives you an additional measure of control.

However, this often requires a third set of hands (one set for each line and the third for engine controls).

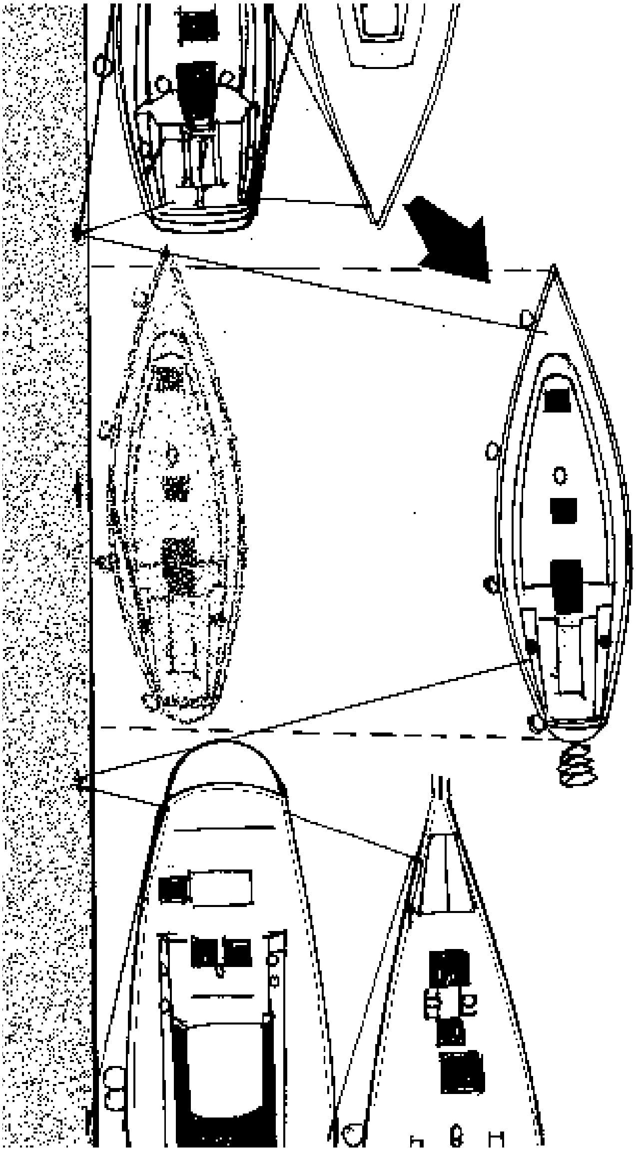
Wind Pushing Off

If the wind is pushing you off the dock you have the advantage of being able to go around again, if required. If you don't like your positioning, just stop, and wait for the wind to cause you to drift back into open water.

On the other hand, this makes it difficult to get the boat against the dock.

In this type of scenario an easily thrown breast line usually works best.

As you come against the dock it will probably be the bow which is trying to drift to off to leeward so the bow line is typically the next line on the dock.



Using Current

When current moves parallel to the dock you can use it to slowly push the boat into position. Simply angle the bow across the current and hold station with slow rpms while the current gradually moves you against the dock.

In this situation the first line ashore will be a spring from just forward of amidships (if it is going forward) or just aft of amidships (if going aft). This type of spring line will give you a good combination of holding power against the current while it keeps the boat parallel with the dock.

Between other Boats

There are many parts of the world where you end up rafting or docking between other boats on a long wharf. Somehow these situations always seem to involve lots of wind and current, and in our experience, cold weather and rain.

When we've faced this type of situation we have launched the dinghy, and then rowed one, or if it is really tight, two, breast lines ashore.

Once these are secured, the operation becomes a simple matter of winching in while keeping fore and aft station with the engine.

Our preference is to raft against motor vessels rather than sailboats, as then there is usually no concern about the position of our rigging.

Depending on conditions, you may want a set of bow and stern lines directly onto the dock (as opposed to just tieing to your neighbor).

Rafting

We really dislike rafting against other vessels. It tends to be noisy, people are tramping across each other's decks at all hours, and it is difficult to move if the weather turns against you. However, there are a number of places in the world where there is no choice.

If that is the situation here are a few things we've learned. First, always ask permission. If rafting is the rule, and everyone else is doing it, and nobody is aboard, you have no choice but to come alongside uninvited.

Be sure to use spring lines in both directions as well as bow and stern lines. Take a good look around and pick winches and cleats for attachment. Don't use travelers or lifeline stanchions as the odds are these will not take the docking load. If there are many boats rafted inside of you, and there is a chance of wind then lines from the bow and stern should be run ashore.

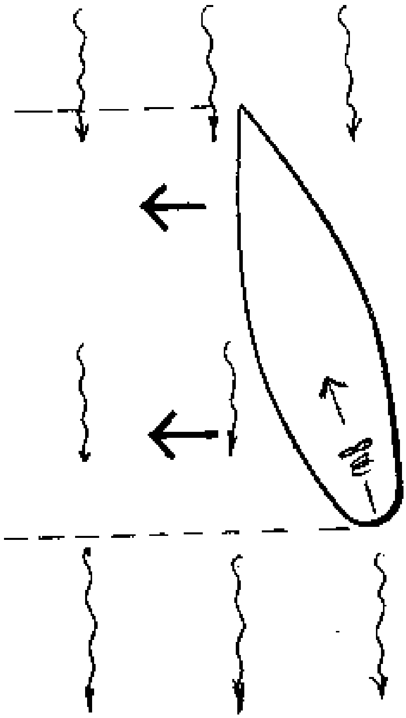
By far the tightest harbor we visited on Intermezzo was on the island of Rodrigues, in the middle of the Indian Ocean. A tiny cut in the reef, barely wider than our 12-foot (3.8-meter) beam had been blasted in the coral. Within the harbor there was no room to turn around. When the time came to leave we were warped by hand into the correct position.

Help

If there's a current against the bow, this can be used to advantage to work the boat against the dock.

Turn the bow slightly towards the dock and then move slowly ahead, with just enough rpm to hold station. The current working against the hull and keel will slowly push the boat sideways.

Typically this is best done so that stern torque can be used to straighten the boat out at the last moment.



When clambering over a neighbor's boat go via the bow rather than through the cockpit. This affords your neighbor a bit more privacy.

Against Pilings

When you are maneuvering against pilings you will want to have your speed reduced to zero as you come in contact. Otherwise, the tendency is to roll any fenders out of position behind the fender boards. With a rubbing strake this is not as critical. Still, running a narrow strake down a piling will make a mess on deck, even if it doesn't scratch the topsides.

Between Pilings

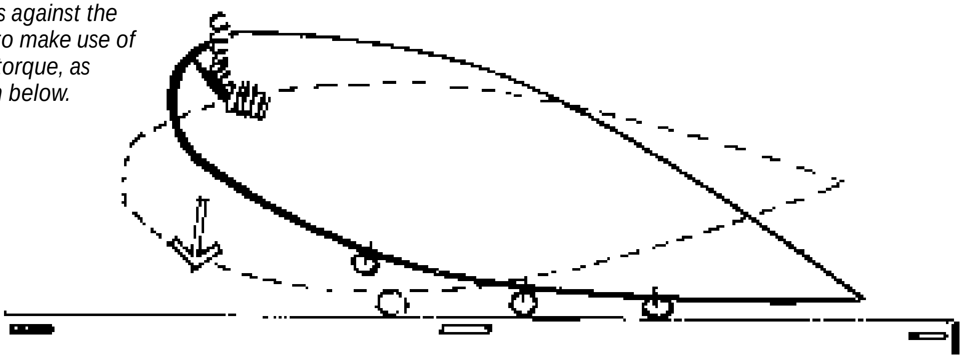
Probably the hardest docking situation is when you have to scrunch in with pilings on both sides. The pilings are typically laid out in rows and there is rarely enough space between the rows to get a clean shot at entering the space amongst these sticks.There is probably going to be a bit of current and wind in the equation as well.

To the folks who live in these areas, who have lots of practice and specially rigged lines, this is not a big deal. But when you first encounter this situation after six or eight months of blissful anchoring it looks daunting indeed.

If you have a rub rail of some sort, the best system we've found to deal with the pilings is to enter in such a way that you can pin the bow against one of the pilings, holding it there with low rpms, until at least one side of the boat is secured fore and aft.

Once this is done, you can then figure out how to set up the rest of the cat's cradle of lines that pilings require.

Forward thrust against the rudder initially pushes the boat sideways—especially if you have a spade rudder in close proximity to the propeller. This can often be used to align the boat if the wrong side of the boat is against the dock to make use of stern torque, as shown below.



Help

Prop Wash Against the Rudder

We briefly mentioned prop thrust against the rudder in the maneuvering section. Let's come back to it now for a second.

You can use the engine in forward to shove the stern against the dock, if you turn the wheel away from the dock first.

This can sometimes be effective in a wind-off-the-dock situation where you want to keep stern torque handy for pulling the boat off later.

This works best if you come in with the boat at an angle to the dock, bow closest, and going dead slow. When you need to displace the stern toward the dock crank the helm over and give a short but hard pulse of power.

Getting Off the Dock

Getting off the dock is usually easier than getting on, unless the weather is really acting up. You have a good handle on the lay of the land, and plenty of time to pre-plan the undocking scenario.

Short-Handed Tips

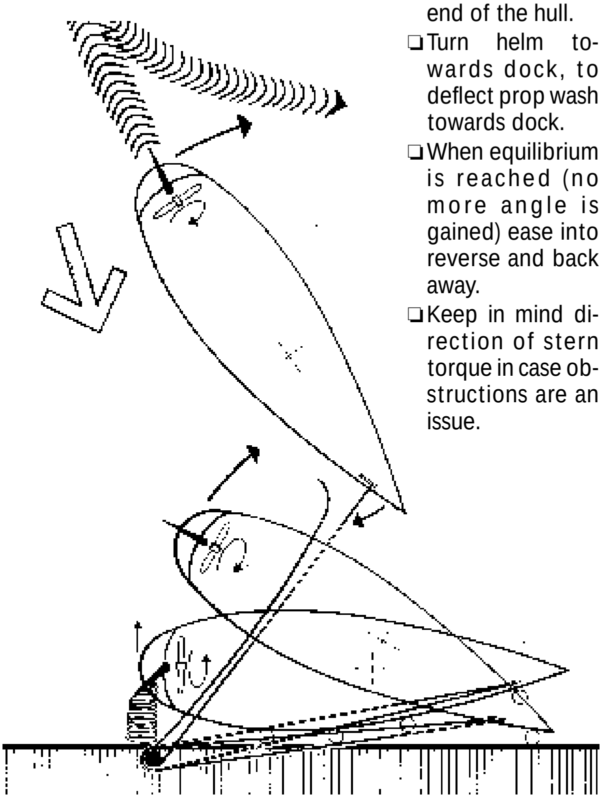
One of the first questions is who is going to cast off the docklines? If there are just two of you aboard, you may need both sets of hands on the boat. In this case, the last two lines to be cast off can be doubled up, i.e., re-rigged so that they begin and end onboard. This way when the time comes to cast off you let one end go (on board) and then pull from the other end to get the line back on deck (making sure it does not get caught in the prop in the process).

Springing Off

A spring line from the bow or stern can be used to rotate the hull away from the dock. The bow spring is always more effective in this process as it allows you to attain a much greater angle off the dock before going into reverse.

We normally double up the bow spring bringing it just past the point of maximum beam on the hull. With a fender or two between the dock and the hull, we then go ahead slow.

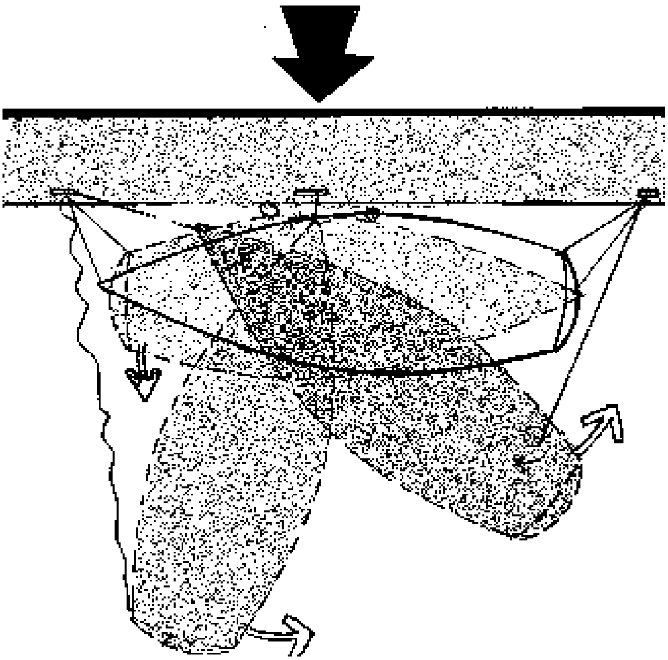
The stern will gradually swing out away from the dock until an angle of 20-degrees or so is reached. At this point, if we need more angle the helm is turned *toward* the dock. This causes the rudder to deflect the prop thrust towards the dock and is always good for another five to ten degrees of angle.



When using spring lines, a combination of forward energy against the spring line and side thrust against the rudder helps generate the greatest angle. Keep the following in mind:

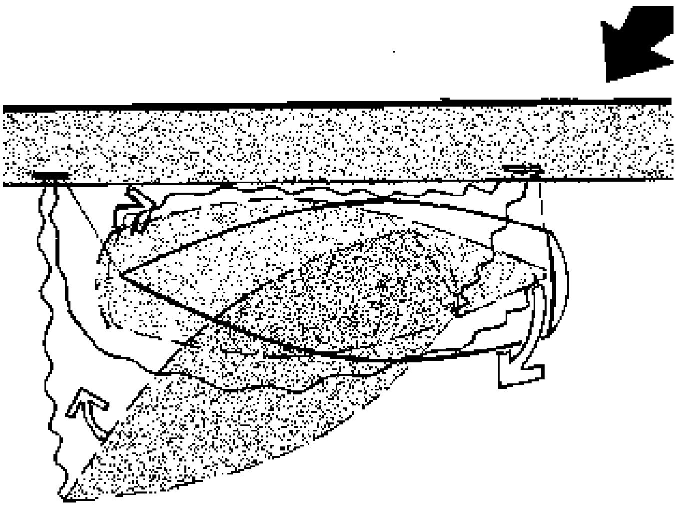
- ❑ Use a cleat at the extreme end with the greatest angle of boat to the dock.
- ❑ Double up spring line so both ends are on the boat.
- ❑ Have a loose fender ready as well as one at the end of the hull.
- ❑ Turn helm towards dock, to deflect prop wash towards dock.
- ❑ When equilibrium is reached (no more angle is gained) ease into reverse and back away.
- ❑ Keep in mind direction of stern torque in case obstructions are an issue.

Help



Two approaches to using the wind and docklines to rotate the boat. Above, with the wind on the beam: 1—Ease port stern line while the bow is brought to the middle of the dock. 2—Bring stern line to starboard quarter, and then begin to winch the boat alongside the dock while the bow line (now on the starboard side) is eased and moved down the dock.

Below, with the wind more on the quarter: 1—Ease port bow line while the stern line spring is cranked in. 2—As the bow drops off to leeward, winch in the (new) starboard bow line and eventually switch stern lines from port to starboard sides as the boat begins to come alongside the dock.



Once equilibrium is again reached the helm is quickly centered and the engine put into reverse.

If you have good control in reverse, you will want to spring off *opposite* the direction of stern torque. This way, as you put the boat into reverse stern torque will get you naturally aligned with the channel.

On the other hand, if you have a problem backing down under power, it is usually better to spring off in the same direction as stern torque. This way the reversing will continue the turn started by the spring line until you reach the point where you can put the wheel hard over and turn down the channel going forward.

Rotating Direction On the Dock

Sometimes it is necessary to change the direction you are headed on the dock to make exiting easier. If the wind is blowing off the dock this is a simple operation. Ease of the stern line, walk the bow toward the center of the dock, and then get a new stern line on the dock and begin to winch the boat alongside.

If the wind is on the dock, you may have to set an anchor to pull you around.

Using an Anchor

Anchors are frequently used by commercial vessels to pull themselves off docks. It makes sense for us cruisers as well.

Watching working windjammers is always good for learning a trick or two. In this case, a stern spring, run aft of the stern is used to pull the boat against the dock. The helm is turned away from the dock (in this case to port) so the forward thrust of the prop pushes against the rudder, and the aft end of the hull against the dock. In the meantime, the aft spring prevents the boat from moving forward. After a couple of minutes the hull is against the dock.

In most cases an anchor set off a couple of boat lengths to weather, just forward of amidships, with the rode coming back to the bow does the trick. Once you are off the dock, the anchor is retrieved in the normal fashion.

At some point you will encounter a situation where there is lots of wind or current pinning you against the dock. This is hard on the fenders and can be very uncomfortable. If there is room to windward, a breast anchor can be used to hold you just to weather of the fenders.

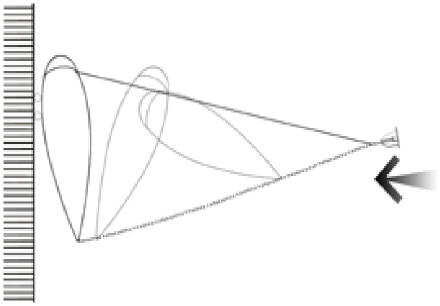
We usually use our kedge anchor (a Fortress aluminum anchor) as it is easiest to handle from the dinghy, if that is required.

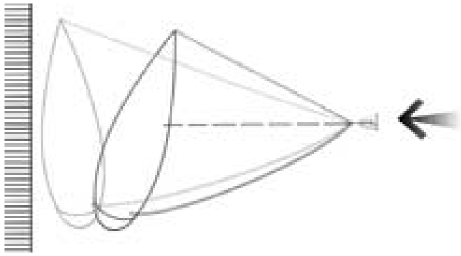
If you have a controllable pitch prop, like the Hundested we have aboard *Beowulf*, a whole new series of maneuvers becomes possible. The controllable pitch propeller can adjust its blades to increase or decrease stern torque. If you want to minimize side thrust you reduce pitch until you have a good head of steam in reverse. Conversely, if you want to rotate or pull the stern onto or off of a dock, you over-pitch which really increases stern walk.

Finally, because the blades can be reversed, so that when you put the shift lever forward the boat goes in reverse, and vice versa, the direction of stern torque can be changed from port to starboard.

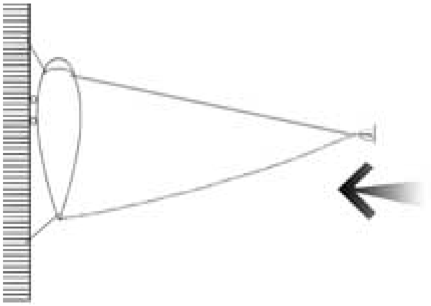
This means you can always pull the boat onto or off of any dock. And, you can rotate either clockwise or counterclockwise.

With these tools in your maneuvering arsenal there is a lot more flexibility concerning where you can enter and more importantly where you can easily exit (we regularly take Beowulf into spaces far tighter than we would have ever dared with the much smaller *Intermezzo*).





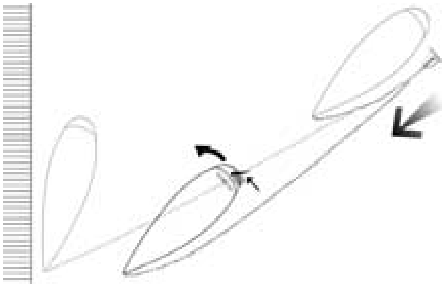
With the wind or current on the beam, set the anchor well to weather with sufficient distance off the dock for proper scope (including room to drag while setting). Use a double rode (as above right) or, a single to the center of lateral resistance (the dual rode is more complex but gives much better control).



If the wind is light and there's not enough force to drift you down to the dock, use the engine to walk the boat (top left) over—either in forward or, if there is good control, in reverse, which is easier on the bow if chain is the primary rode.

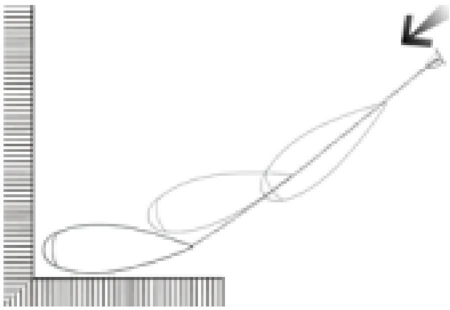
Once you are against the dock the rodes can be adjusted as required to hold you off (opposite left). Be sure to buoy the anchor if there is potentially a problem with traffic.

When the time comes to pull off the dock it is normally easiest to use a spring line. However, if there are obstructions close by, or the wind/current has the boat pinned, then the anchor is the perfect way to get some distance to windward.

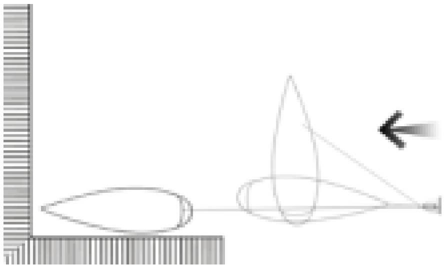


With dual rodes just crank yourself off. Or, if there is a single rode, perhaps just forward of the center of lateral resistance, use fenders on the aft part of the hull to keep it clear of the dock as the boat rotates somewhat to windward.

Another approach (middle drawing) is to head downwind with an anchor off the bow. This is used to both stop the boat and swing the bow away from the dock. However, careful braking on the rode is required to slow the boat.



*A single anchor to windward is helpful for getting on or off a difficult dock (this is the same system we used with Intermezzo docking in East London, South Africa—see page **133**). This drawing assumes the wind is on the quarter, and the anchor is set on an angle to weather. Once it has dug in, the wind will take you back to the dock. Or, you can work the engine in forward/reverse with the rudder hard over to starboard and walk the boat sideways against the bow rode.*



The most straightforward use of the anchor is right off the bow, still valuable for warping the boat clear in difficult conditions.

Papeete, Tahiti, some years later. This time we're Med-moored with Sundeer.

Mooring Mediterranean-Style

Mooring Mediterranean-style, in which the boat's stern is tied to the dock or quay while her bow is held by an anchor, is becoming more common in many parts of the cruising world. Mooring Med-style creates two sets of problems. The first are mechanical. Your boat must do something few boats do well: back down in tight quarters. To compound the situation, precise anchoring is required.

The second set of problems stems from the nature of the moorage. Gunwale-to-gunwale boats means a large critical audience is in attendance. The slightest faux pas is eagerly awaited, while the participant's urge to yell, scream, wave, jump, or simply sit down and cry must be controlled. The skipper has to stand at ease, head erect, stomach flat, chest out, and direct the foredeck crew with a nonchalant comment or two. An occasional burst of power or turn of the helm should be all that is required to control the boat.

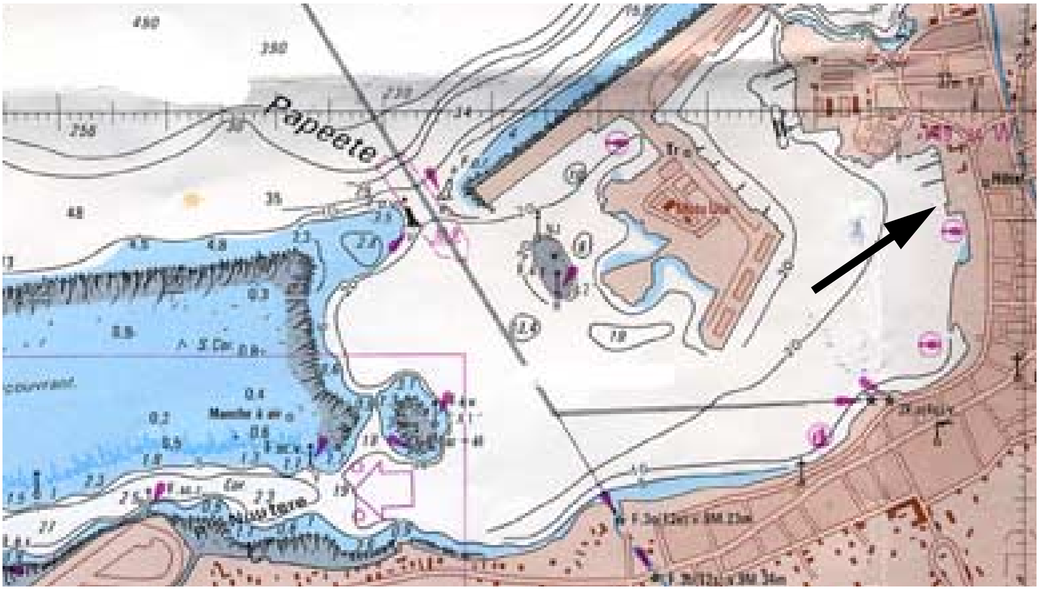
First light has *Intermezzo* and her crew lined up on the range outside Papeete Harbor. For years this place has been our goal. Visions of Quinn's Bar, Tahitian maidens, and tropical paradise are filling my head. Linda is fantasizing, too, about a night on the town. After all, it has been five months since we've been in civilization. Elyse's and Sarah's main concern is the availability of ice cream.

We are about to confront mooring Med-style for the first time.

Papeete harbor serves both commercial and pleasure vessels. The yachts get the quay alongside the front of town. The first 60 can tie stern-to the sidewalk. After that it is coconut trees and light poles behind the beach. As we power around looking over the situation, we spot *Win'Son* and Jim and Cheryl Schmidt, whom we last saw in Fatu Hiva, in the Marquesas.

Med moor check list:

- ❑ Anchor ready to launch and run free.
- ❑ Rode flaked neatly on deck and ready to go.
- ❑ Stern lines ready to throw.
- ❑ Fenders in place on topsides and transom.
- ❑ Is there current which needs to be allowed for?
- ❑ Wind and drift rate?
- ❑ Will stern walk offset wind or current or augment them?
- ❑ Maintain relaxed pose and signal quietly to the foredeck.



A chart of Papeete Harbor. This pass is wide open, well marked with lights, and even has (usually) a working set of range lights). But the first couple of times you go in or out should be in daylight.

The area where everybody goes stern-to is in the area of the black arrow.

"Bring her alongside us!" Jim shouts.

Heads start popping out of the companionway hatches. A new arrival has been spotted, and the already settled sit down in their cockpits to watch the fun. It is obvious we are the morning attraction.

The space Jim wants us to use can not be more than 14 feet (4.3 meters) wide. Given *Intermezzo*'s 12-foot, 6-inch (3.8-meter) beam, it leaves 9 inches (230 millimeters) on each side, just enough for fenders.

Med Moor Preparation

To make a clean Med moor a certain amount of preparation is necessary. Ground tackle is a good place to begin. "What kind of holding do you have?" I yell across the water.

"Got a good bite the first time," comes Jim's reply. Knowing that Jim is among the onlookers just waiting for a mistake, I have to decide if this is straight data or perhaps a bit shaded—just enough for us to make fools of ourselves.

Anchor Selection

Anchor selection is important. A CQR or Bruce-style anchor will work well in a hard bottom, but thin sand over rock or soft mud will make the use of a Danforth type advisable.

Next, there must be substantial rode available. The anchor may have to be dropped farther out than normally would be the case, as this gives more room to maneuver in reverse coming into the dock.

If chain is being used, the operation of the windlass clutch will be critical. Does it release and brake the chain gypsy evenly?

Deciding that discretion is best in our case, I break loose our 35-pound (16-kilogram) Danforth. It is sufficient to restrain our boat in a beam

Help

wind, when the loads on the anchor will be substantially greater than when the boat is allowed to weathercock. The Danforth will also bite in more quickly than the CQR, and if the mud bottom is soft rather than hard, it will do a much better job of holding.

To make the anchor easy for Linda to drop, I tie a 3/8-inch (9.6-millimeter) line, doubled up, to the end of the shank. She can simply let one end go when I give the signal, dropping the Danforth exactly where I want it. We also flake 250 feet (75 meters) of nylon rode down the deck to ensure a smooth run. I don't want to chance a foul-up in front of this audience.

Rigging a Trip Line

In a tight harbor the anchor must be dropped in precisely the right spot, so if you waste a few seconds, you are out of position. When we use an anchor on chain, we drop the anchor part way down over the bow roller, ready to go. With heavy anchors, those over 75 pounds (35 kilograms), we also rig a trip line, which we cut at the precise moment the anchor is to be dropped, as we have been stymied by balky windlass clutches more than once.

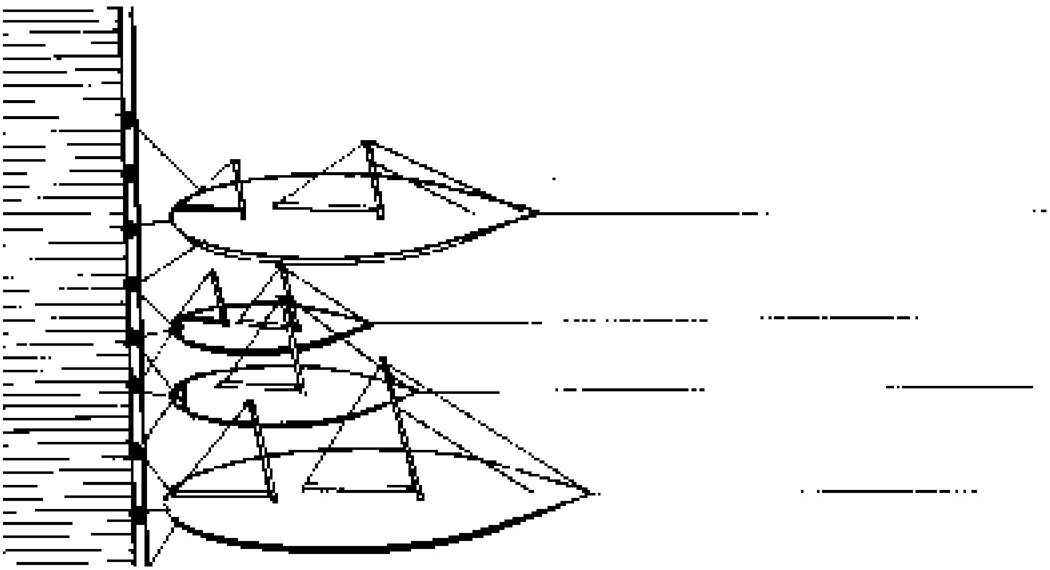
When we have the ground tackle squared away, we hang fenders on both sides to appease the concern of our about-to-be neighbors.

Finally, we feed our stern lines through their chocks and out over the top of the pushpit and coil them down, ready to throw.

Backing Tactics

The particular tactics you employ to position yourself depends on the backing characteristics of your boat and the relative direction of the wind and current.

One of the key factors with a Med moor is the wind direction. If it is on the bow, as shown below, even a really difficult boat to maneuver in reverse—like Intermezzo—can be gotten into position. But when the wind is on the beam the situation is a lot more demanding and often taking a line ashore with the dinghy is the best bet.



Help

Med-mooring with an amateur audience is one thing—they'll cut you some slack if you are less than perfect. But think about the peer pressure the professionals face when they sneak into a tight spot, such as that shown above in Falmouth Harbor, Antigua, in the West Indies. Okay, they've got lots of help. But these are huge, unwieldy boats. If they can do it, so can you.

Wind is the most critical consideration. If it is light and on the nose, life is simple. Starting dead upwind of your chosen space, begin to back down; when the bow passes the exact spot for the hook, the foredeck hand lets the ground tackle go. *Be sure to allow distance for the anchor to drag a bit before it sets*; with burying anchors this distance can be substantial, especially if the bottom tends towards soft. Pay out the rode, without strain, until there is sufficient scope for the anchor to start digging in. Then apply some friction so the bow stays head-to-wind. If your boat tends to back in a circle, you will want to start this procedure at a compensating angle, so she is backing straight when you reach the spot you want to drop the anchor. Then the friction of the rode can be used to help her stay in a straight line.

Accomplishing the same task with a crosswind is more difficult and demands flawless timing. If your vessel will back down with control, you can position her well out from the desired spot to build up enough way to back her up straight despite the wind.

If your boat is contumacious in reverse and the wind is blowing opposite the direction her stern wants to turn, the wind can actually be used to compensate for prop torque.

When it is impossible to power the stern to the appropriate spot there is an alternate system. Set the bow hook conventionally and then row a long stern line ashore. Once the stern line is secured, a winch can be used to crank you home.

Help

In our case, boats and anchor lines are chock-a-block about us, and the only thing we have going for us is a light breeze on the starboard beam. It might be enough to check *Intermezzo*'s tendency to circle counter-clockwise in reverse.

Linda and I run through the procedure with the anchor and rode again, and Sarah is stationed near her mom to relay messages from me at the helm in case Linda has to watch the rode. Elyse is ready with a stern line.

Clear Communication

The bow hand must keep one eye on the skipper and dock. As the stern closes with the dock, the rode must be tightened up, setting the hook and stopping the boat. At the appropriate moment the stern line is tossed, or better yet, handed, across. It is important at this point to appear cool and in control of the situation, even if your heart is pumping madly.

Finally all is set, and I nudge *Intermezzo* into gear. We head up harbor and stop with the stern at a 45-degree angle to our final course. As the wind starts to blow the bow off, I put her into reverse and then signal to Linda.

"Mommy, Daddy is waving!" announces our intermediary.

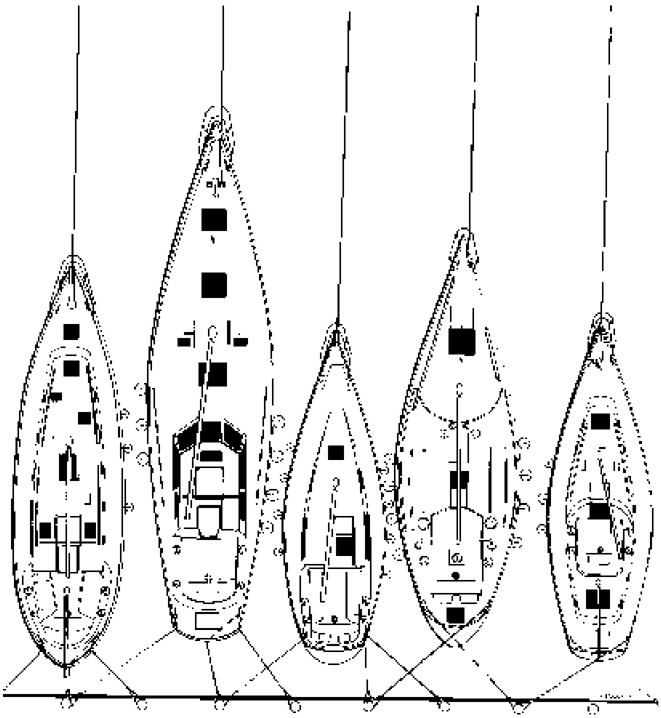
The anchor splashes down, and I put the helm over and move slowly astern. This is the critical point. If we are lucky, and if there is enough drag on the bow rode, *Intermezzo* just might put her stern alongside *Win'Son*. If the hook doesn't bite properly, I may need to use a sudden burst of power to push the boat back into clear water. I won't have much time to decide if I want to avoid blowing into my neighbors.

Securing the Stern

There are several choices for how the stern lines should be tied. One approach used in tight anchorages such as Papeete is to cross the lines to keep the stern from swinging and to avoid running a line across a neighbor's lines or transom. Splaying the lines outwards from the stern avoids chafe on your own lines but may annoy your neighbors. If you've plenty of space between boats, a set of lines can be run out from

There are many ways to secure the stern. The best, if there is room, is to take lines from the stern corners outward. Then, if required, use a mid line to control distance off.

An alternative is to cross the lines from the stern corners. However, this tends to create boarding problems as they are usually in the way.



Help

Las Hadas Hotel Marina in Manzanillo, Mexico—still a wonderful spot to stop 17 years later. We were heading north, finishing our circumnavigation and the Liggetts, aboard Sunflower, were heading south. We hadn't seen each other since the Solomon Islands three years before. It was a great get-together! Note how Sunflower's stern lines are splayed out.

Below one of the many ways of fixing transom fenders.

the quarters to control side-to-side movement while a single line from the stern adjusts distance from the dock.

"Why don't you all join us for breakfast after you're secure!" calls Jim. At least we have one friend in the anchorage. We may need time to break the ice with the other cruisers. After all, our flawless mooring procedure had just deprived them of the day's laughs.

Tension on the rode and docklines from wind, tide, and current may require us to readjust them later, or even reassess whether we need a second anchor. We double-check our distance from the quay; even in quiet harbors we make it a habit to put some distance between ourselves and the dock and then winch ourselves in when we want to leave or board the boat. When moored in a harbor with surge problems it may be best to leave the stern some distance out and use the dinghy to get back and forth.

The key to success in anchoring stern-to is being prepared. With the right ground tackle at the ready, knowledge of your boat's backing characteristics, and two or three practice runs, you should handle the Med moor with ease.

The Dinghy as a Tug

Over time it is inevitable that at some point engine failure will force you to sail into an anchorage. There may then be a tight marina where you'd like to tie up, but sailing is out of the question.

When this happens, look at using your dinghy as a tug. It is just amazing what a tiny outboard will do with a large yacht in *calm* waters.

We've actually maneuvered *Intermezzo's* 17 tons in some very tight spots with a 4-horsepower engine mounted on the back of our dink!

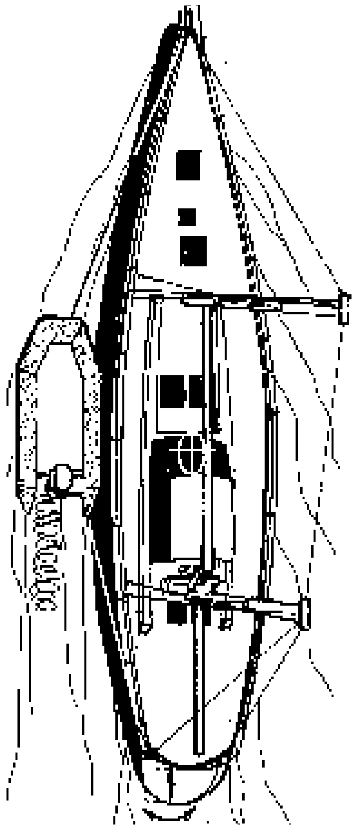
When using the dink as a tug having it tied alongside usually works the best.

This makes it possible for the larger vessel to use its rudder for steering which is far more effective than trying to use the outboard turned in one direction or the other.

Dink Alongside

The best system we have found is to tie the dinghy alongside, using long fore and aft lines, with the outboard set opposite the center of lateral resistance.

The load on the dinghy transom is higher due to the resistance of the big boat, so you want to be sure that the outboard is tightly clamped.



One of the problems with this approach is that one person needs to be in the dink to run the outboard. The noise of the outboard makes it hard to communicate so a set of pre-determined hand signals needs to be set up in advance.

Acceleration will be very slow. It can take a minute or more to get up enough speed for the big boat's rudder to begin to steer effectively.

Towing

Towing is rarely as effective as tieing alongside. If you do try this approach you will need to have a bridle worked off the stern to distribute the load evenly into the transom of the dinghy.

If this is not done the dinghy will tend to pull first in one direction and then in another. Even with a bridle this may be the case, in which case it is best to switch to tieing alongside.

Steering

With the dink at the center of lateral resistance there will be little you can do with the outboard to steer the boat.

Steering will have to be done by the big boat's rudder.

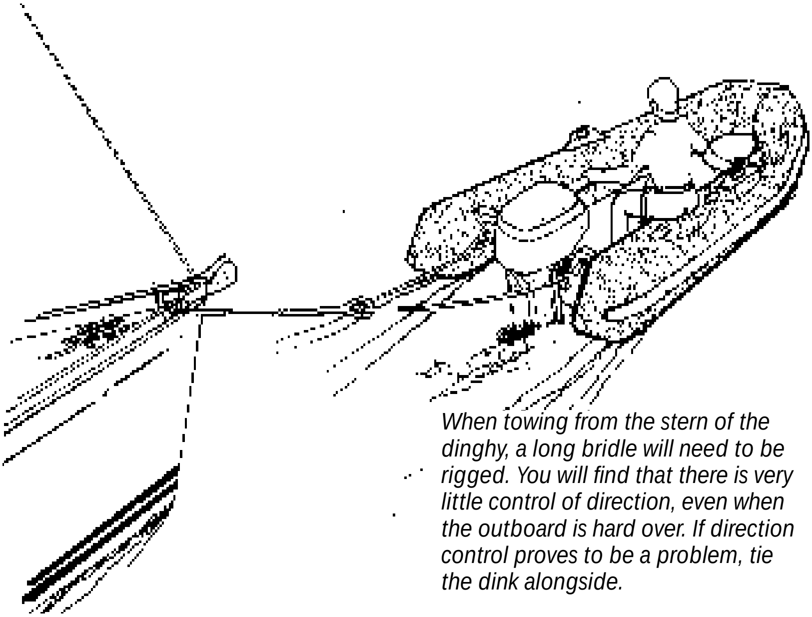
If you have a long-keeled yacht it is best to experiment with steering while there is plenty of room. You may find it works better to tie the dink all the way aft, where turning the outboard at right angles can push the stern in one direction or the other.

Stopping

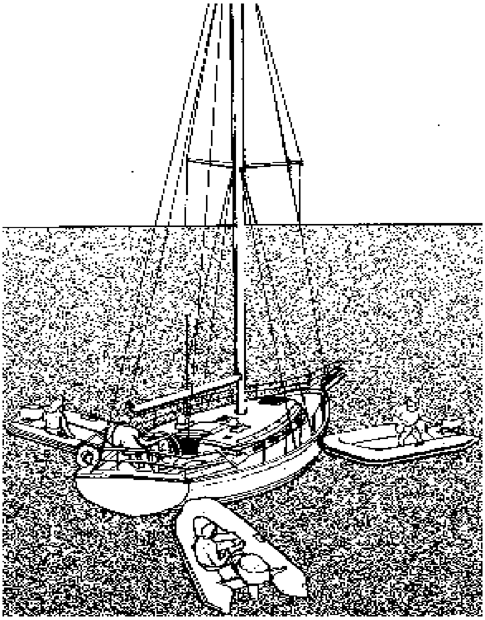
Stopping is always a problem. Just as it takes awhile to get up to speed, the same thing happens in reverse. Yes, the outboard will eventually stop you, but it going to take some space.

When using the dinghy as a tug:

- ❑ Have pre-arranged hand signals for stopping, starting, speeding up and slowing down.
- ❑ Discuss where to push and how to communicate, and the spot to be pushed against.
- ❑ If side-tied do so with long bow and stern lines.
- ❑ If towing, use a long bridle.



When towing from the stern of the dinghy, a long bridle will need to be rigged. You will find that there is very little control of direction, even when the outboard is hard over. If direction control proves to be a problem, tie the dink alongside.



Inflatables make great pusher tugs, ideal for rotating the boat in tight spots, or squeezing into a space between two Med moored boats with a cross wind.

If you watch the mega-yachts—usually equipped with bow and stern thrusters—you will find that more often than not they use their inflatables for moving the ends of the boat.

What we've found works better is to have a lightweight kedge anchor ready to go over the stern, with the rode flaked down on deck.

We know that this will stop our forward momentum, after which the dinghy can be used to rotate or push us into the desired space.

Inflatables with Large Engines

As the size and power of the dink increase you have more options. The inflatable can be used more like a conventional tug; tied alongside for the longer runs but then used to push wherever required in close.

Want to turn? Push on the bow or stern?

The key here is to keep the inflatable headed in the correct direction.

With an 8-horsepower (or larger) engine you have a lot of capacity, and it is important to use as much finesse as possible. Minimize power used and you will find that the dinghy is much easier to handle.

Help

Here's a real world everyday working schooner in Camden, Maine. The Rosebud takes tourists on day trips and has to maneuver into and out of a very tight harbor. With the aid of their hard dink and a 25-horsepower outboard they rotate her 180 degrees in this series of photos. It is calm, but they can pull this off in 20-knots of breeze, if required.

The dink is pushing at the very end of Rosebud's bow, to gain maximum leverage. The skipper can use little nudges on the prop, forward or reverse, to keep her in position.

She has substantial stern walk to port and if the wind were blowing on the port beam in the middle photo, short bursts of reverse could be used to bring the stern up to windward.

Help

WEATHER

There is no subject that is more on the minds of sailors than that of weather. It affects everything we do, and all of the tactics we use from anchoring to sail selection.

Obviously it is in the interest of all mariners to have a feel for what is about to happen. Not only does this make you a better seaman, but weather forecasting, pitting your skills against the professionals on television (or NOAA), is fun.

If you understand what makes the weather systems work—and it is not that hard—this knowledge can be used to make faster, more comfortable and above all safer voyages.

Equally important, those nagging "what if..." questions are for the most part removed from the minds of the crew (and their captain).

How can you get it right when the professionals miss so often? The professionals are at a serious disadvantage. They tend to rely on super-computers with hugely complex programs costing millions of dollars. (There are numerous ultimate computer atmospheric models and these seldom agree with one another.) They have thousands of inputs from around the world for the models, but little data is available to them from the better cruising regions. So they are often flying blind in the areas we all like to cruise—depending mainly on the computer models (which are quite accurate on a large-scale basis, but often very wrong on a micro-basis.

On the other hand you have the advantage of being on the spot and being able to look outside at what is happening around you. If you keep track of your barometric pressure, watch the cloud development, track wind speed/direction, and pay attention to the sea-state, you are much more likely to make an accurate forecast than that computer in a government office thousands of miles away. The forecast data can help put what you see in context, and in that regard it is valuable. But the official forecasts are typically not nearly as reliable as what you can do for yourself.

For those of you interested in learning more about weather analysis, forecasting, and tactics we've written *Mariner's Weather Handbook*.

What to Learn

It wasn't very many years ago that getting a good handle on weather took years and years of study and practice. Weatherfaxes were hard to come by on land, and studying the synoptic charts in the daily newspaper left a lot to be desired.

But today, with e-mail and the internet there is a wealth of data—from raw computer outputs to daily broadcast faxes for all over the world—which we can study in the comfort and security of our homes. This is a never-before-available opportunity to learn, practice, and find out how well we are doing without paying for the consequences of our mistakes!

Analyzing Risk Factors

For us, the single most important part of using weather know-how is understanding the risk factors inherent in any given situation. You cannot expect the weather service to advise you on this subject.

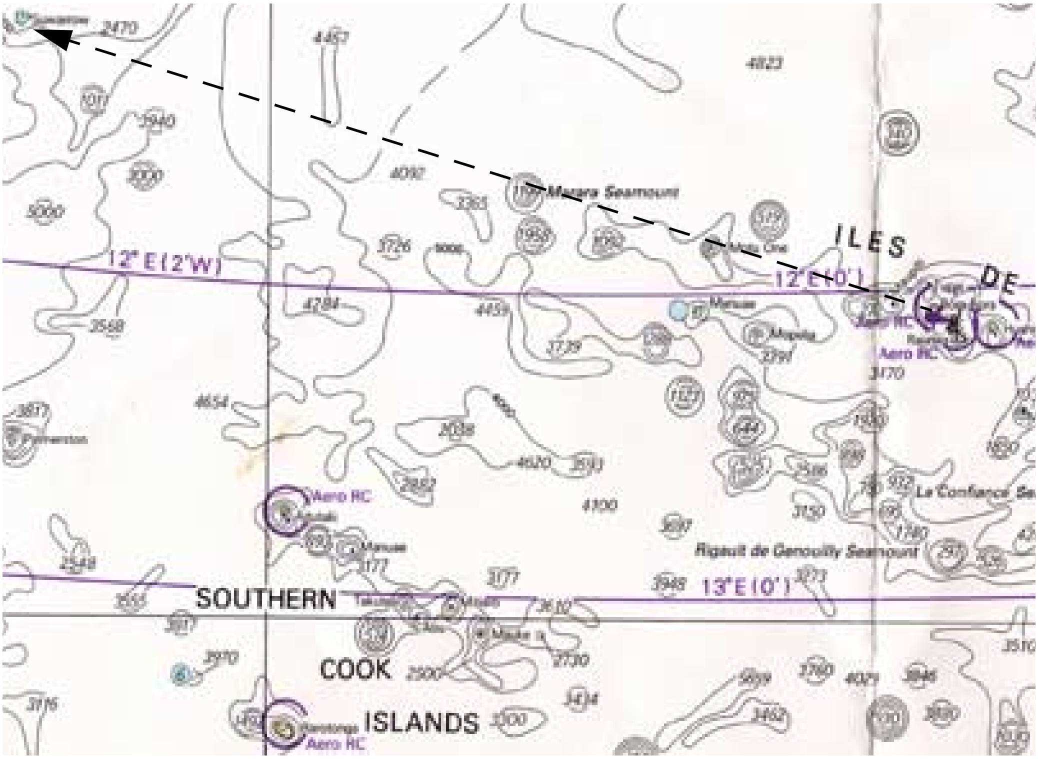
Consider the 1998 Sydney-Hobart Race for a moment (analyzed at length starting on page 260 of *Surviving the Storm*). The day before the race there were four critical elements in play. First, a large, stationary high pressure system sat over New Zealand, to the east of Sydney, Australia. Second, the upper-level atmosphere was giving ample warning that a vigorous surface low would develop shortly.Third, the race boats would be sailing through an area of warm current with both substantial temperature variations and current to oppose the waves. Finally—and this is the wild card—a subtropical area of low pressure was sitting to the northeast in the Tasman Sea.

Understanding the risks in any given situation are the strongest reason we can think of for spending the time and effort necessary to gain the knowledge necessary to become your own weather forecaster.

When the forecasters looked at these factors they knew that the *potential* was there for a real blow, if all the elements engaged just right. On the other hand, the odds of this turning into a meteorological bomb were low.

Of the six models the Australian Met Service typically uses, only one predicted anything serious. Most of the others showed a moderate (normal for this part of the world) gale or storm.

Now, any professional or amateur could look at these four elements and say "Hey, we better watch this as the potential is there, especially if that subtropical low takes an abnormal course due to the high pressure system over New Zealand, and ends up feeding energy to the system we think is going to develop in the Australian Bight."



The trip between Bora Bora and Suvorov is free of navigational worries, once you are a day away from Bora Bora. Then the only issue is finding Suvorov (not an issue today, but a big one pre-GPS). The currents almost always flow in an easterly direction, and cross seas, if they exist, are typically moderate. In short, it should be a wonderful passage—unless you leave at the wrong time as we did!

But the odds of this are low; maybe one in 50 or one in 100. At this point the professional outlook and that of we sailors diverge.

The professional has to walk a tightrope between being a Pollyanna, or issuing so many false alarms that they are ignored by the public, and of course they can't miss the big ones. It is a tough act—and one where mistakes are made all the time.

However for us the question is a lot simpler. If there is a one- or two-percent chance we are going to get caught in a survival storm do we go, or wait a day or two and let things sort themselves out? That's easy—we wait.

Bora Bora to Suvorov

When we started serious cruising in the mid-1970s both of us had a better handle on weather than many of our contemporaries. This understanding came from our racing background. But we still didn't really know how to make the weather work for us, other than in the most basic ways. And our skills at reducing discomfort and/or risks were rudimentary at best.

A good example of how *not* to use the weather was our first passage between Bora Bora in the Society Islands (French Polynesia) and Suvorov in the Northern Cooks (our approach to Suvorov is discussed starting on page **195**).

The trades had been blowing steadily from the southeast for a couple of weeks when the time came for us to move on with our voyage. We pre-

Help

pared *Intermezzo* in our normal fashion, checking systems, rig, steering, double-lashing gear on deck, setting storm covers and bending on our storm staysail (which we had not yet used).

When the appointed morning to depart dawned the weather pattern had changed. Gone were the cumulous tradewind clouds to be replaced by towering thunderheads interwoven with an 80-percent overcast. Our barometer had dropped a couple of millibars as well.

The wind was still southeast, but now puffy and unstable. Whereas before we'd had only the occasional evening shower, this morning there were large periods of heavy squall activity.

But we had a strong boat, were confident in our abilities, and there were stories on the ham net of unlimited supplies of lobster on the reef at Suvorov—and a big party—that tempted us onward.

So we waited for a clear spot between squalls, and then headed out the pass. This turned out to be a mistake.

As the day wore on the breeze began to back to the northeast, increasing in strength, until it was blowing a steady 45-knots, gusting higher. We quickly shortened down to double-reefed main and storm staysail. Our RVG windvane couldn't cope with the steering loads, but the Benmar pilot would hold us on heading, as long as we maintained sufficient speed.

By late evening that first day the puffs were coming through in the 60-knot range, with the wind a steady 50. We would have very much liked to be back at anchor in the lagoon at Bora Bora, but beating back against this wind and the rising sea was not an option.

So we continued on.

The ride was exhilarating, to say the least. We learned a lot about handling *Intermezzo* in these conditions, and by the time we were closing with Suvorov the wind had dropped to the 25-knot range and seas were beginning to shrink a bit.

The weather pattern that caught us today is well understood. It was a convergence or shear line between two slightly differing air masses. The shear line itself is what brought what we should have recognized as frontal activity. The slight drop in the barometer, overcast and large thunderheads, increased squall activity and instability in the southeast trades were all strong indicators.

In the South Pacific (or anywhere in the tropical Southern Hemisphere) any time a shear line is present, you can usually expect stronger northeast winds after it passes.

Had we understood the weather patterns, and recognized the signs, the prudent thing to do would have been to wait until the northeast wind shift, and then check and see how much build-up there was going to be.

Today, with the knowledge we've gained over the years, and the availability of fax and radio forecasts, this becomes a very routine exercise.

Most cruisers have way more to do than time (or budget) to do it in. So at some point priorities have to be established.

Most of us want the same end result—enjoyable cruising. The question is what are the most important skills and/or equipment to have aboard to further these ends?

If you talk to experienced mariners, both amateur and professional, you will get many different opinions on any given subject. But about weather forecasting they universally agree—understanding analysis, forecasting, and tactics is the single most important thing you can do to make your cruising safer and more enjoyable while speeding passages.

Our suggestion is to move the acquisition of this skill to the top of the "to do" list!

Pattern Recognition

The most important part of working with weather is understanding weather *patterns*. Pattern recognition comes from studying the data in an ongoing manner, so you start to understand how the highs and lows go through their life cycles and how they interact with each other.

There are certain basics which you will need to know. But once you understand these, it is simply a function of how the pieces of the weather puzzle are fitting together.

A key factor to understand is that the patterns vary from year to year and season to season. The patterns which apply this year may not work the same the next. The underlying principles will be consistent, but the details—what we're interested in on the water—vary constantly.

The above notwithstanding, with a basic understanding of what is driving the weather, what you then need to do is watch the weather that exists before your voyage to get a feel for the current scenario.

We do this by running our weatherfax for several weeks before each long passage, usually once a day until four days or so before departure, after which we go to a two-to-four-times-a-day schedule.

Using the Internet

Of all the modern tools that are available for weather—and there have been huge strides made in this area in the last five to ten years—nothing is as important for learning as the internet.

As we mentioned earlier, the internet allows you to access the written forecasts from all over the world and most of the broadcast fax charts.

You can tap into all of the major computer models—some with outputs of 10 to 14 days (which are obviously less reliable than closer-in forecasts)—and get data for any area on the earth.

You can get satellite imagery galore. Visible and infrared (which are also available onboard) as well as the all-important water vapor images. It is even possible to access buoy and ship reports.

The best way to learn is to look at the current, 24- to 48-hour fax charts, and then make your own forecasts as to what you think is going to happen. Then, 24 hours later, compare the new surface analysis—which tells you what the current conditions are—with what you had forecast. Do the same thing with the professionals, to see how they did.

Practicing in this fashion allows you to learn without paying penalties for the learning curve. At the same time, you are developing a familiarity with the weather patterns.

There are so many weather sites available on the internet that we've bookmarked our favorites, and made them available at **www.setsail.com**. We change these periodically, so check back every so often to see what's new and exciting.

Air Masses

There are two fundamental factors at work creating our weather. One is the fact that differing types of air masses tend to stay separated. So warm, moist air masses will remain distinct from colder, drier air. High pressure systems tend to stay separate from low pressure systems.

Between these varying air masses are relatively sharp lines of demarcation—the frontal boundaries with which we are so familiar.

The second factor is heat. The sun provides energy to the atmosphere in the form of radiant heat. This heat is applied unevenly, depending on how the earth is tilted on its axis—which is what causes the seasons. Obviously the daily cycle makes things more uneven.

The unevenly heated air sets up a circulation pattern around the globe, based on the fact that warm air is less dense than cold air so it rises.

This means that in general, the areas directly under the sun—the tropics—have warmer, rising air, which spreads out towards the colder poles of the earth, where the air is cooled, becomes more dense, and descends.

The warmer areas, with rising air, have lower pressure than the colder areas, with descending air.

Now toss in the effects of the earth's rotation on these air masses. Because of surface friction a spin or angle is imparted to the air masses which are closest to the earth. These gradually dissipate with altitude as the friction effect drops off. This spin—called the Coriolis Effect—is what causes highs and lows to rotate, and the wind to blow at angles to the pressure isobars around the high and low pressure system centers.

It is the difference in the air masses—variations in moisture, temperature, and pressure—which provide the energy that creates our surface weather.

Three-Dimensional Atmosphere

The effects we see of the weather look and feel like they are occurring in two dimensions, in what seems to be a thin area near the surface, because that is where we live.

However, to understand how weather works, and to make best use of the forecasting tools that are now available to sailors, the weather needs to be looked at as a three-dimensional phenomenon. Not only does it move parallel to the earth's surface, it also moves at up-and-down angles, sometimes vertically.

It is this three-dimensional interplay which creates the calms and storms.

Surface Lows

Surface lows are air masses of lower pressure (less dense), which because of their low pressure eventually vent or rise to the upper atmosphere. This takes place in a cyclonic form, with the winds rotating around the area of lowest pressure, at the center of the air mass. Generally speaking (but not always) as you get closer to the center of the low

The passage from New Zealand to New Caledonia can be a piece of cake, or a real battle, depending on how the weather is played. Fortunately, the forecasts in this part of the world are now pretty good—but the right tactics have to be used.

pressure air mass the wind speed increases as the pressure decreases.

In the Northern Hemisphere these lows rotate counterclockwise. In the Southern Hemisphere lows rotate clockwise about their centers.

Surface Highs

Surface high pressure systems are just the opposite. These originate with heavier (and therefore denser) cool air from aloft. This dense, high pressure air sinks to the surface and then spreads out, once again with a rotational spin imparted to the air mass by the Coriolis force, but highs rotate in the opposite direction of lows. In the Northern Hemisphere this spin is clockwise about the center. In the Southern Hemisphere the spin is counterclockwise.

New Zealand to New Caledonia

Once the mechanics of weather are understood, it is then possible to make tactical decisions concerning weather systems. The changes in wind patterns within highs and lows can be used to eliminate beating (or reduce it substantially) and to pick faster and/or more comfortable wind and wave conditions during a passage.

Our trip from New Zealand to New Caledonia aboard *Intermezzo* is a good example.

Recall that Southern Hemisphere highs circulate counterclockwise. In the spring, when we were making this trip, there are typically a procession of highs followed by lows, sweeping into the Tasman Sea from the southern bight of Australia. The key to a fast and comfortable trip is to catch the leading edge of a high with its south to southwest winds, and then ride it up into the tropics, and tradewinds, before anything nasty can work its way into the equation.

Help

The trip is roughly 1,000 sailing miles, and one needs to make it halfway before getting into the usually benign influence of the trades.

All of this was well known, even back in the olden days.

It was early May and many of our cruising friends were gathered in the Bay of Islands, at the northern end of New Zealand, doing last-minute chores, watching the weather, and discussing tactics.

There were no faxes in those days, and satellite imagery was in its infancy, but we were downwind from Australia and the New Zealand forecasters had the advantage of Australian data with which to make their forecasts.

A series of rainy fronts had heralded the coming of winter, and we were all ready for some tropical cruising.

Then one day the forecast said "high pressure system moving into the Tasman over the next few days. Expect settled weather til mid-week." and the preparations took on a more earnest schedule. Everybody wanted to use this high for their passage to the islands.

We were going to be sailing alongside our friends Jim and Cheryl Schmidt and their 70-foot (21.5-meter) *Win'Son*. With the last of our groceries stowed New Zealand customs drove up from Whangarei to clear our two boats, and late in the afternoon we were ready to put to sea. With the barometer starting to rise and the sky clearing, we knew the forecast was right on the money.

Our preference has always been to leave in the morning on a long passage, after a good night's sleep. But between clearing customs, and picking up some special cheese and salamis we'd ordered, it was now late and we were a bit tired to boot.

The Schmidts were in the same state, and after a short conference we decided to stop for the night at Whangaroa, a lovely port a few miles up the coast.

After a brisk sail to Whangaroa Heads we powered into the totally protected, and rarely used harbor, found ourselves a lovely quiet spot in which to anchor without a soul in sight, and began to relax. We'd leave in the early morning.

Shortly thereafter Jim and Cheryl launched their inflatable and came by for a visit. There was an inviting beach a short distance away and before long the kids had their pails and shovels in the Schmidt's inflatable and off they went to explore. When they returned an hour later this intrepid crew of beach goers had loaded the Zodiac with "pippis," the New Zealand equivalent of a littleneck clam. These are a real delicacy and before long both crews were fast asleep, having eaten their fill of this local bounty.

The next morning we awoke early, ready to head off to New Caledonia. But the day was warm, the anchorage protected, and the winds appeared light. "Let's stay another day" was the universal chorus. That one extra day tuned into two, and then three. Whangaroa is truly a magical place.

It is extremely difficult to judge the strength of the wind and state of the sea from inside an anchorage.

We often find that if the breeze seems to be whistling in the rigging and the surf is booming on the barrier reef, that once we are outside, heading downwind, conditions are much more mellow than we imagined.

On the other hand, in a land-locked harbor, like Whangaroa, the opposite is often the case. You think it is relatively benign until you actually get outside and then the wind and sea hits with unexpected force.

We have learned the hard way to always assume it is going to blow, and there's a good sized sea running, and prepare the boat in that context.

We have also learned (again the hard way!) to have all hatches tightly secured, just in case we take an errant wave on deck on our way out the channel.

We deal with ventilation once we are sailing and can accurately judge the risks of leaving a hatch or two open.

Life goes on, even when you're heeled 30-degrees and beating into 12-foot (3.8-meter) seas. Linda is baking fresh bread while Sarah tests the bread dough (she still likes raw dough, as does her father).

The kids had a great time sliding on pillows across the steeply heeled saloon floor. We were a little more sanguine about the passage.

However the high was marching on, and we were all ready for a swim in some clear, warm tropical water and so on the fourth day we departed.

As soon as we cleared the North Island land mass we got into the unobstructed high pressure flow. The wind was 15 to 20 knots from the west south west. This, plus a 1031mb barometer gave us a pretty good indication that the high pressure system was moving on.

Had we left as originally planned, the winds would have been much more southerly making this a broad reach. Now they were on the beam—wetter, slower, and much more uncomfortable. And the question that was now in the forefront of our thoughts was the western edge of the high, where the northerly quadrant winds resided. Would this get to us, creating a beat or would we get north fast enough to avoid this set of winds?

We were pushing *Intermezzo* hard, racing both *Win'Son* and the high pressure system. As the breeze lightened that evening we even set our reaching spinnaker. The Schmidts, with lots of fuel capacity, cranked up their Jimmy diesel and pretty soon came powering up from behind us, and then over the horizon.

"Hey guys, it's not fair to use your engine when you are racing!"

By early morning hours we had our engine on, too. And then the breeze abruptly came back, first from the northwest, then north, and then finally north-northeast. New Caledonia was now a hard beat.

We won't bore you with the gory details of the rest of the trip. Suffice it to say it was not the most pleasant passage we've had. The wind blew 30 to 40 knots until we were within a day of Noumea, at which point it laid down and backed to a more tropical 20 to 25 knots from the northeast.

Intermezzo always had a deck leak or two and this trip was no exception. In fact, virtually everything aboard was wet.

Sitting at anchor when we arrived was the stately *Armanel*, a 75-foot (24-meter) ketch which had left the morning we'd cleared. Their trip? An easy broad reach for the entire passage.

This passage taught us a really good lesson, which we're still using today. When conditions are right, we go. Period. If there is something enticing to delay our departure, we weigh this against the possibility of having to wait a week or two until the next ideal weather situation arises. Most of the time we just go when the weather is right.

Frontal Boundaries

Within low pressure systems there are often two masses of air, separated by frontal boundaries. The first air mass you typically see or feel is the warm sector. There is usually a gradually falling barometer accompanied by the approach of the warm sector, and often a definitive line of clouds, increase in squall activity, and of course, rain.

Some period later will come the boundary of the colder, drier air mass within this overall weather system. This cold front is usually much more abrupt. There can be a significant drop in pressure just before the cold front arrives, and often a massive squall line. With the passing of the cold front the pressure jumps, the sky starts to clear, and it is not unusual to find the wind increasing (but sometimes it drops).

And with each frontal passage there is a shift in the wind direction. This is usually most pronounced with the cold fronts.

You often find a high pressure system building behind the cold front demarcation of the low pressure system.

Wind Issues

It is the rate of change in the pressure over time and distance which affects how hard the wind is going to blow. The faster the change, the windier it will be.

On fax charts this is judged by the closeness of the isobar lines of equal pressure. However, there are several other factors which affect wind as well.

One is the shape of the isobars. The wind tends to accelerate around highs when the curvature of the isobars increases (gets tighter). In areas of straight isobars the wind blows less hard, and in hollows it really drops.

With lows this works the opposite. Areas of curvature actually reduce the wind speed while straights and hollows tend to increase it.

Between highs and lows you will often find areas of compression, where the isobars are squashed together between the two systems. Tightening of isobars always has the same effect—the wind increases.

Finally, you have land influence. Often mountain ranges will compress the wind, and/or force the higher winds from aloft down to sea level. Or, there may be a range blocking normal patterns, with large valleys, through which follow the escaped, now accelerated winds. The Gulf of Tehuantepec (which we referred to on page 39) is one such area.

500mb fax charts are available in many parts of the world, and off all of the world-wide computer models.

If you are interested in pursuing this further go to the weather links on at www.setsail.com and you will find a wealth of 500mb data on the internet.

500mb Weather

We've saved the best for last. It is in the upper atmosphere where surface weather starts—and if you understand how things work up high, you will be way ahead in the entire process, especially with regard to deciphering risk factors. Here are the basics in a very rudimentary form.

First, it is what is known as the 500mb level where most of the activity of interest to sailors starts to take place. This is typically at an altitude around 20,000 feet (but this varies with temperature).

Using this data is even more pattern-based than for surface charts. Understanding how the 500mb level works is within the grasp of every sailor, but to make use of this knowledge practice with pattern recognition is essential.

What happens is essentially this: the upper level atmosphere travels in a variety of waves most of the time (with occasional periods of straight line movement). The shape of these waves, and the way the wind/temperature/pressure is distributed within them, creates areas of vacuum which suck up surface level air, and areas of denser air which fall to the surface.

These areas of vacuum are the start of all non-tropical surface low pressure systems. No upper level vacuum, no surface low pressure. Period. End of story.

These upper-level waves have behavior patterns, and once you begin to understand these, you have a good idea of what the risk factors are within the weather systems you may be working with. Most important, if you understand the 500mb level, you will see the *potential* for severe storms well before they are announced by the weather service.

Understanding weather in general, and the 500mb in particular, is pure and simple the best thing you can do to have safe, comfortable, and fast passages, while keeping risks to an acceptable level—whatever that is for your own situation.

Staying Ahead of the Curve

How do you defend yourself against the vagaries of mother nature and the weather service? As we've said, the answer lies in being alert to the elements and using age-old techniques: Note the barometer, sky, sea pattern, temperature, and atmospheric conditions. Keep your senses tuned.

Here are some basic rules for staying ahead of the situation. First, always trust your own instincts if they indicate the possibility of worse weather than the official forecast.

Second, be aware of special signs in your area that forewarn of weather disturbances. Every region has them. For example, off the coast of Southern and Baja California, clear winter nights and a high barometer are precursors of the cold northeasters that swoop offshore, trapping the unwary on the lee shores of the coastal islands. Anytime these conditions exist, the possibility of a real blow is present, even if the weatherman isn't forecasting one yet. Keep your senses tuned for offshore windshifts, a sudden drop in temperature, or a new swell.

Third, if you're traversing bodies of water with large temperature differentials between surrounding waters and/or air, be especially careful. Temperature gradients provide increased energy for storms, and when a continental cold front hits a warm lake or a major ocean current, a moderate breeze can turn into a dangerous gale very quickly.

The Gulf Stream is infamous in this regard. Three out of four of our roundings of Cape Hatteras have seen moderate frontal weather accelerated by this warm ocean river into something to write home about. In two of the these cases the weather was unannounced, but each time the NOAA forecast of moderate frontal conditions was enough to alert us to the *possibility* of something worse, giving us plenty of time to prepare.

Fourth, if you're in unfamiliar waters the pilots and cruising guides may give you some of the local signs to watch for. Better yet is a talk with some of the local professional seamen. Then, after you have the basics down, keep an ear tuned to chatter on the VHF. The professionals' livelihood is tied to the weather, and you can bet there will be some degree of warning of impending change over the airwaves.

Even though the professional forecasts in your area may usually be reasonably accurate, always keep your senses attuned, just in case this is the time the big mistake is made. Remember too that there can be substantial time delays between when a weatherman receives the raw data upon which his forecast is based, when the prognosis made, and when you hear it over the airwaves. In many cases this time window can be as wide as six to twelve hours—plenty of time for something to catch you daydreaming.

If you're alert and willing to forego a snug bunk on occasion for a sniff of the night air and a walk around the decks, the odds of getting really caught are minimal—just enough to add a little spice to your cruising life.

Navigational Constraints

Of course, you never can be 100-percent certain of the weather you will encounter. You can reduce risks but never totally eliminate them. Any passage-making planning must, of course, take into account the characteristics of the vessel and the area through which you'll be traveling. Are there intermediate ports you can use in the event that weather threatens to overtake you? How difficult are the entrances? Can they be negotiated in foul weather, with a sea running, or at night? Will you be on a lee shore? How seaworthy is your boat? How fast can she move under power (including range) and under sail? The wind often dies in the approach path of a major storm system, and with good powering speed/range you can scoot out of harm's way. Finally, how prepared for heavy weather is the boat and crew?

We have found it quite handy to write up weather "targets" in the log or on Post It notes. These are points in time that we expect to see certain things happen with the weather, if the situation is going according to the forecast.

For example, you might expect a frontal passage by 1800, so you would be looking for a drop in the barometer just before this time, and then the barometer to rise and wind to shift directions as the front passes over you.

Sometimes we'll make up what we expect to see happen for several weather scenarios—so we pick out early what is happening in our area, and apply the best tactics.

Some of the target data to watch are:

- ❑ Barometer trends and target pressures.
- ❑ Magnetic wind direction.
- ❑ Wind strength trends and gustinmess.
- ❑ Sea state.
- ❑ Changes in cloud cover.

Coastal Passages

Coastal journeys entail less risk weatherwise than longer offshore passages. Weather data is apt to be more reliable and harbors of refuge closer at hand. Thus, weather factors are not quite as important as they are when you journey offshore, where you will be at risk with the elements for many days. Because frontal systems can move so quickly, it is impossible to predict that an entire offshore passage will be free of bad weather. Most sailors play the odds; they pick the best season for voyaging and then try for the clearest shot within that time.

Tropical storms get a lot of press, but it is actually the much larger higher latitude systems which are more dangerous to us. This is because tropical storms are actually quite small in size relative to the higher altitude systems. They also move at a much slower pace—typically 7 to 15 knots (compared to 20 to 50 knots for the high latitude systems).

*A*s a result, the tropical systems are much easier to dodge, and tend not to generate as large a sea as do the bigger, faster-moving systems.

Picking Your Window

There are two approaches to picking the final departure time. One is to wait until a clear period appears to be developing. It may result from a lull between weather systems, in which case powering may be the best way to move. Or a slow-moving high-pressure system or even a double high may bring temporary stability to an area. A high tends to block any deep lows before passing on, but beware: highs can also deal wind.

A second approach is to wait until a favorable, somewhat stable weather system exists and then ride it as long as possible. This is the "better the devil you know than the one you don't" theory.

A major factor to consider when you are working up strategy is the direction you are sailing relative to the direction the weather is moving. In general, westbound vessels sail into weather and eastbound ones away from it. If you are heading east, then the weather overtakes you. This means there's a much longer period between changing systems. If the low or high is moving at 15 knots and you are going 7 knots in the same direction, the system will come closer to you by only 190 miles a day.

On a passage that runs the same direction as the weather, you may get two or three days of grace, enough time to complete many voyages without undue hardship. But if you are heading towards the system, a day may be all the time you have before a major shift in conditions.

Revolving Storms

Revolving storms that start out as tropical lows are particularly potent systems to watch. These storms have different characteristics in various parts of the world, and while they tend to display set patterns in formation, speed direction and movement, wind development, and size and have some degree of predictability, they do not follow the same patterns as open weather systems. For example, Western Pacific typhoons are generally larger and have higher windspeeds than their Atlantic or eastern Pacific cousins, and they follow less of a seasonal pattern. Western North Pacific typhoons have been known to develop in all months of the year with some degree of frequency, although they tend to occur more often in summer months.

If you choose to make a passage where the potential for one of these lows to develop is greater than you would like, you must maintain a

Help

careful watch of weather reports. You need to decide in advance how cautiously to play this cat-and-mouse game with disaster. Sailors do make successful passages between revolving storms, but reliable power and good range are prerequisites. You have to be prepared to turn tail and run if the storm begins to head in your direction. It is often possible to dip towards the equator to avoid tropical lows, since they rarely move into the equatorial zone. And you must be prepared to head away from the storm's expected path, even if you must turn away from your final destination. Finally, you must always keep in mind that tropical storms are to some degree unpredictable and can jog suddenly or reform quickly after seemingly having died.

Be careful about the type of landfall you are going to make when tropical storms are about. Overcast skies with heavy rain can extend many hundreds of miles from the storm center. If good visibility is required to close with land, you may have to wait.

As sailors gain more experience offshore, they tend to treat passages that expose them to potential heavy weather with more respect. One result is a tendency to power when the wind dies; the simple fact is that when the potential for heavy weather exists, the less time you spend at sea, the less likely it is that you will be caught. We have gradually evolved from the purist's point of view, never touching the starter button on the diesel, to the pragmatist's approach. If, when we are at sea and our speed drops below an efficient motoring level, we turn on the engine. It is not pleasant to listen to, but it makes for quick, safe passages.

Using the Barometer in the Tropics

In the higher latitudes it takes a lot of pressure differential to create strong winds. However, in the tropics small pressure differentials can lead to major blows.

That is why it is a very good idea to keep a close eye on the barometer. Any deviation from the normal diurnal change in barometric pressure is cause for attention. If the differential is more than two millibars, something is definitely brewing in your area.

Storms which Change Structure

Every year large vessels (like container ships) and small yachts get hammered by tropical storms which are in the process of changing their internal structure.

This doesn't need to happen at all, as the warning signs are quite clear. You just need to understand the risk factors when they are present.

Here's a simplified version of what happens: The tropical storm system hooks a ride on a high pressure weather system. If there is an upper-level trough which is in the right position to provide a surface venting for the tropical storm structure, it takes over from the self-contained tropical structure.

You now have upper level venting, and an accelerated movement, combined with the huge left-over energy potential of the tropical storm system—the heat and humidity the tropical system carries is like throwing dynamite into a fire.

These transitional storms can literally explode in area covered and speed of movement—50 to 60 knots is not as unusual speed for one of these systems to move.

Secondary Lows

There are occasionally secondary low pressure systems, often small in size, trailing off the frontal line from the primary storm system. These are almost always on the equator side of the primary system, i.e., closer to heat and humidity. On occasion, as the primary system begins to dissipate the secondary cranks up, and then absorbs the left-over energy from the primary system. Or, the secondary system will revitalize the primary, with a new dose of tropical energy. These combined or re-energized systems often are more severe than the primary. The storm which hit the 1979 Fastnet race was such a system

Baroclinic Storms

We've left the worst for last. Baroclinic storms (also known as comma head and Kaiser-Shapiro storms) are by far the worst systems. These account for most of the explosive storm system structure, including the 1991 Halloween Storm on the East Coast (immortalized in *The Perfect Storm*) the 1994 Queen's Birthday storm, and the 1998 Sydney-Hobart Race blow.

Baroclinic storms develop explosively, and can go from a gale to hurricane force winds in less than a day—occasionally catching the professionals by surprise. However, the warning signs are there if you are looking for them on the 500mb fax charts. You just need to be aware of what you are looking for, and then if the risks exists (and they do more often than the storms actually develop) take the appropriate precautions.

Tactics

How you use weather systems to advantage, while staying away from unhelpful or dangerous weather is outside the scope of this book. Both of these topics are covered in detail in our *Mariner's Weather Handbook* and *Surviving the Storm: Coastal and Offshore Tactics*. The point we want to make here is that a majority of the time, it is possible to make the weather work for you rather than against you. All you need to have is a basic understanding of the principles of analysis, and forecasting, and then some simple rules about tactics. You really can do it!

Bermuda to Newport

Probably no passage illustrates how to use (or not use) the weather than the conditions you find between Bermuda and the East Coast of the United States.

Bermuda is far enough away that unless you are very lucky, you are going to get hit with at least one low pressure system and associated fronts (and maybe more). The problem is exacerbated by the Gulf Stream. You have these cold, relatively dry continental weather systems running over the warm, moist Gulf Stream and this provides an extra burst of energy. This always increases local squall intensity, and can sometimes affect large storm systems for a day or more.

Join us now aboard *Beowulf* as we prepare ourselves for a passage to Newport, Rhode Island.

St. David's Harbor

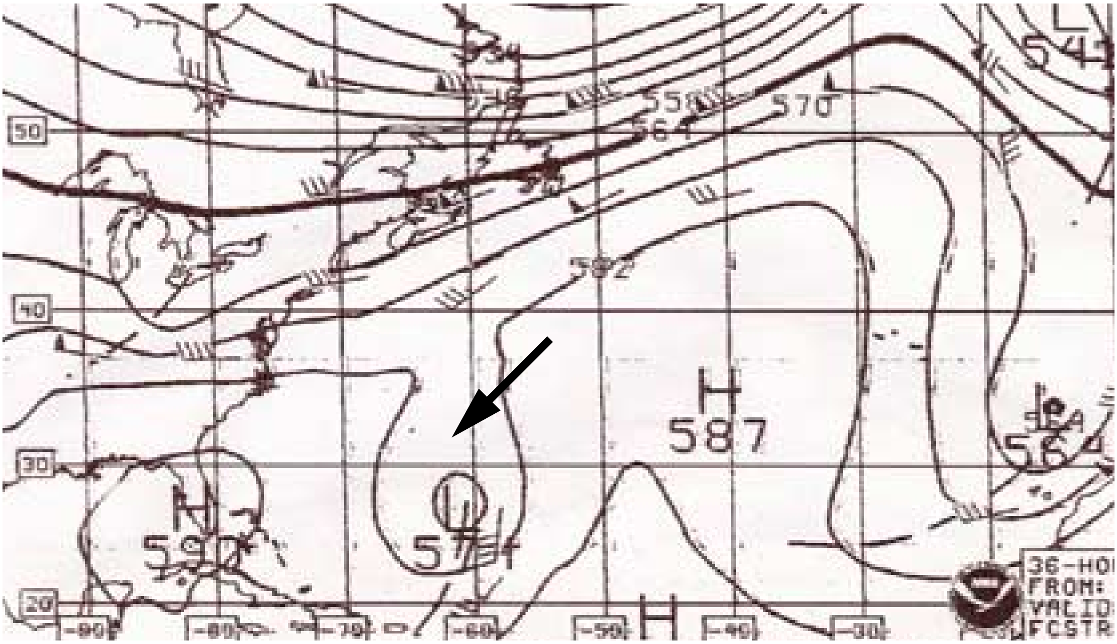
Saturday, May 20, 1700. Bermuda makes for an excellent decompression chamber before making one's way to the States. There is drugstore music on the radio (along with rap), lots of traffic whizzing by during the day, all kinds of stores to tempt you into buying unnecessary items, and a really nice supermarket. And the most important item—good boat watching. This is, after all, one of the major cruising crossroads.

Beowulf is anchored in St. David's, surrounded by boats from around the world, in all shapes, sizes, colors, and materials. There are a couple of 150-foot plus Perina Navis, *Rebecca* (140 feet) is here, there are two L. Francis Herreshoff reproductions, and even a copy of Joshua Slocum's *Spray.*We've been through the reef to the big city of Hamilton, done all of the tourist bits—lots of walking, museums, cool forts, art galleries, eaten out, and stocked up at the aforementioned "super" market—the latter probably being the highlight for Hamilton—they even have really good sourdough bread!

The weather has been unusual, the locals say. On the 500mb charts there is a classic cut-off upper-level low. This has brought lots of rain, and breezy northeasterly winds; not exactly good for tourism or voyaging to the States or on to the Azores. However, the Bermuda high is making a stab at re-establishing itself. The barometer has jumped 4mb to 1018, the winds have eased off and gone east to east-southeast, and all of the forecasts from the Marine Prediction Center are showing a resumption of the prevailing southwest flow—which is what we want for a fast passage to Newport.

The marine weather forecasters in Bermuda enjoy chatting with yachties—as they do in most places. When we talked to them this morning they told us the upper-level low was moving out and that they were expecting things to improve. The customs office on the wharf each day posts a four-day forecast along with position data on the Gulf Stream. For 25 cents a page you can get your own set—very handy.

Bear with us from here on out as we get a little technical with the weather. We're going to explain the situation at the surface and at the 500mb level, to give you a day-to-day feel for working with weather on a complex passage such as this. Unless you've studied weather a bit, some of this may seem a little hard to grasp at first. However, stick with us through the fax charts and explanations.We'll indicate where in *Mariner's Weather Handbook* you can find more information on the topics being discussed.



All of the fax charts which follow, unless otherwise noted, were recorded aboard with our Furuno dedicated weatherfax, and then scanned for this book.

The chart above is for May 19, 2000 and is a 36-hour 500mb forecast. The black arrow indicates the location of Bermuda.

Just below Bermuda is shown a 574mb "cut-off low" (Mariner's Weather Handbook page 166) which has been messing with the weather for almost a week.

Note the "zonal" flow (for more info see Mariner's Weather Handbook page 158) across the top of the chart. This is an indicator that something is brewing in the next few days.

Between what the local forecasters are saying and what we can see in the MPC weatherfaxes, Sunday or Monday may present us with a reasonable weather "window".

The issue between here and the East Coast is the successive continental lows which seem to be marching along every two to three days. These are supposed to be further north this late in the year and should not be affecting us in a negative manner. But they have not gotten the message, so we've got to be careful. As we're on a collision course with the continental weather, the time frame which we have to make it across is much reduced. In this context there are several considerations.

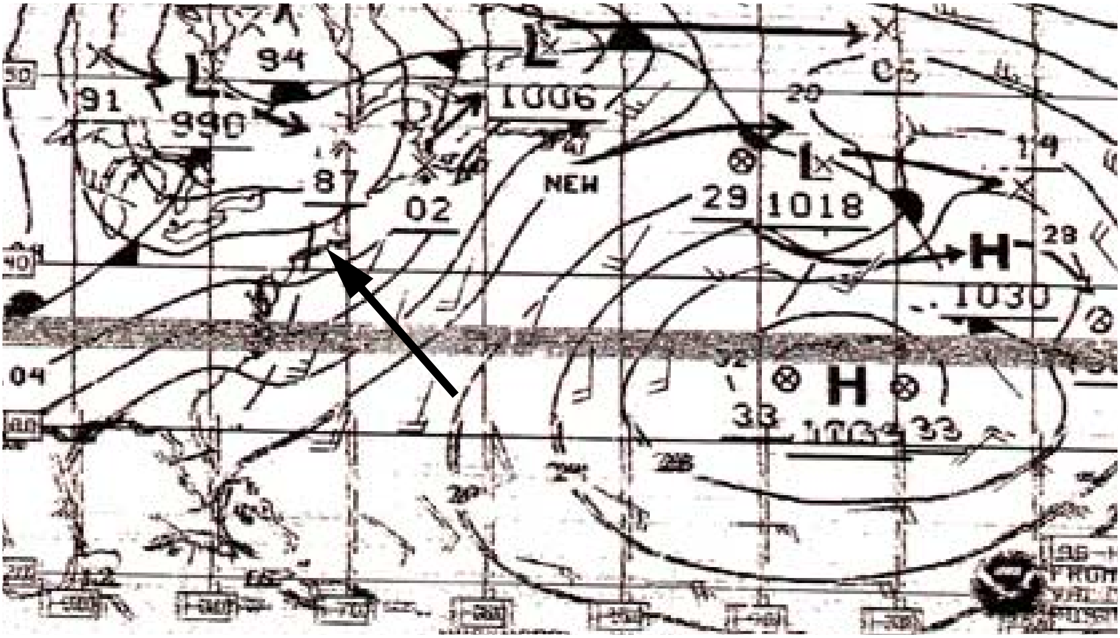
First, ahead of the fronts you have southwest quadrant winds—which are favorable. However, on passage of the front the wind goes northwest and then (usually) north. As our course is 330-degrees True, post-frontal winds are right on the nose.

Second, it is better to avoid unstable weather when crossing the Gulf Stream—which we'll do about half way across. There are the bigger seas you always find there—typically breaking if it is blowing moderately hard—and increased gustiness and/or substantially stronger mean wind speeds due to the warm water heating up the colder air mass.

So, the first order of business is to avoid being caught in or near the Gulf Stream in frontal weather. If we do get caught up in a frontal passage, we'll stay on port tack as the wind goes around to the north or northeast, and then flop over onto starboard when we can lay our destination—the latter being flexible depending on what the wind gives us.

We're going to add the services of Commander's Weather to our arsenal for this passage. We'll let you know what they have to say shortly.

Help



Ready to Roll

Sunday, May 21, 1800. The weather picture between here and the East Coast is starting to clarify and improve its potential. The Bermuda Weather Service, Marine Prediction Center, and Commander's Weather all show southwesterly flow building out towards Bermuda in the next 24 hours. The upper level low over Bermuda for the past four or five days (seen on the 500mb fax charts) has moved off and the sun is out—hooray. We've been drying out awnings and cockpit cushions, in anticipation of storing them below for the upcoming passage.

The way the 48-hour "progs" (forecasts) look right now, we'll leave some time on Monday, probably towards mid-day. The trade-off on departure time is this: the later we wait, the better southwest flow we'll have when we leave here. However, the later we arrive near the coast, the higher the chance we'll have a cold front pass over us, bring a shift to west, then northwest, and finally north winds—more or less right on the nose.

Ideally, the cold front will pass ten minutes after our anchor is down in Newport, Rhode Island. The freezer is stocked with pre-cooked meals, brownies, and a yummy fruit cobbler which we just tasted to be sure it was up to standard...it is.

All we need to do now is clear customs, wipe the bottom and prop, set the storm covers, and double-lash the dinghies.

Monday, May 22, 0923. The wind has swung to the west and although light, is an indication that the southwest flow shown to the west on this morning's fax charts will probably fill in as predicted. *Beowulf* has cleared customs, the dinghies are double-lashed, storm covers are in place on the hatches, and our two big reachers are on deck and ready to go.

The Sunday morning 96-hour surface forecast. The Marine Prediction Center has very good forecasters, and hundreds of millions of dollars in super-computers, and their 96-hour forecasts are often accurate. But no computer (or forecaster) in the world can do a consistently good job with the variables which are present with spring (and fall) weather, not to mention the Gulf Stream.

If the weather plays out like this chart shows, we are going to have a very, very quick trip—probably on the order of 48 to 50 hours.

One big worry is the huge depression shown over the Hudson Bay (990mb low center). If it moves early, hits the Gulf Stream and intensifies, we're in for a real pasting.

The forecasts for Thursday a.m. still show a cold front coming off the New England coast, so it is going to be a race to see if we can get into port ahead of the frontal shift—and the beat which that event entails. Speaking of races—we met the skipper of the lovely *Rebecca* (a 140-foot Frers) while clearing out—and as we're both going to Newport, we've agreed to a friendly race. They're giving us a six-hour handicap. The winner gets a six-pack of his or her favorite beer. This should be interesting.

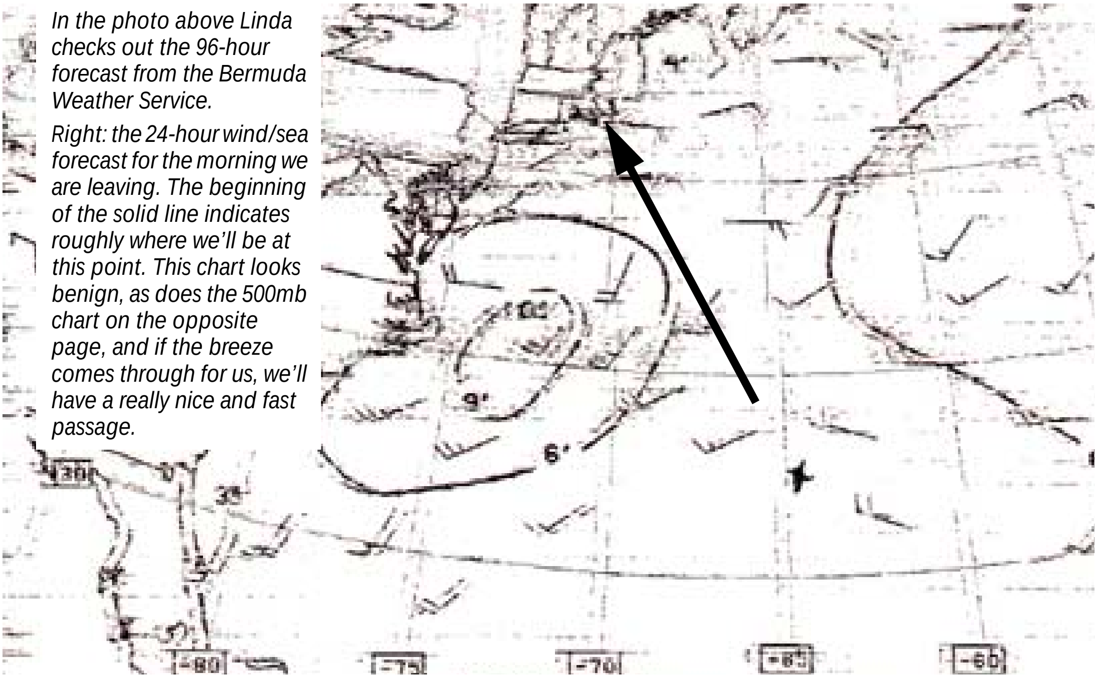
As soon as we stow the laundry, now flying happily on our starboard side, we're off towards Newport...

Well, not quite. Upon hoisting the main we notice a small vertical tear just behind the bottom slide attachment to the mast. As the sails are radial cuts, with fabric rotated to take all of the load on threadlines rather than stitching this should not be a problem. However, given the weather we may be facing we decide to make a quick repair with contact adhesive. Just as we finish *Rebecca* completes her shuttling of crew back and forth and begins to hoist their dinghy.

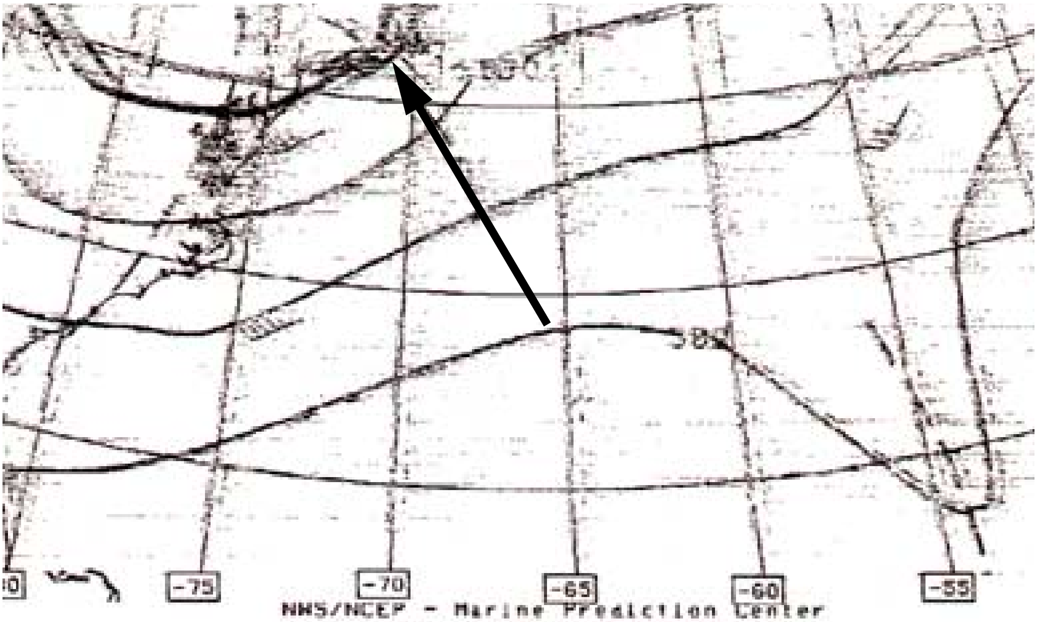
We follow them out through the Town Cut, towards the sea buoy, anxious to be on our way so we get to Newport before that developing storm near the Hudson Bay can have any effect on us.

In the photo above Linda checks out the 96-hour forecast from the Bermuda Weather Service.

Right: the 24-hour wind/sea forecast for the morning we are leaving. The beginning of the solid line indicates roughly where we'll be at this point. This chart looks benign, as does the 500mb chart on the opposite page, and if the breeze comes through for us, we'll have a really nice and fast passage.



Help



En Route

We've got our sails up as we head out. *Rebecca* powers out, and then heaves to off the sea buoy to get their sails hoisted. This is a cool mega-yacht, the first of any of this breed that has caught our eye. Not only is she exquisite to look at, but she is simple in her ketch rig. She has a conventional main and mizzen, fully battened, with lazy jacks. None of the in-the-mast or -boom inefficiency (or ugliness) here.

But it does take her awhile to get moving. In the meantime, having left her behind, and this being a cruising race, we are motorsailing around the northeast corner of the reefs.

We call Bermuda Harbor radio to say good-by and thank them for their help. Also, we ask them to record our time at the sea buoy, in case we get lucky with the weather.

"You don't really expect to break *Play Station*'s record" comes the reply. "They were hitting 30 plus knots on their passage."

We inform them we are a cruising boat, and the record we are after applies only to cruising boats with at least one dinghy on deck (we have two).

The breeze is fitful and it appears we'll have to burn some diesel fuel. But as we clear the reefs and work our way towards Newport it fills in from the southwest at 15 knots.

We've got both reachers set, and are doing a steady 12- to 13-knots. Nothing to write home about, but we'll take it in these conditions. *Rebecca* is behind us a few miles, sailing just a hair slower as we track them on radar.

1620 and we spot our friends on the motor yacht *Sunset*. They are to leeward of us, returning to Bermuda to sort out an autopilot problem, and

The 500mb chart above was received just after the surface forecast. Note how the upper level trough has opened up and moved well to the east (around 55-degrees west longitude). The rest of the upper-level flow looks fine—no warning signs here and the charts projecting out further look about the same as on the previous day.

Help

right on *Rebecca's* track. We say hi on the VHF and inform them we're in a "race" with *Rebecca*. They think we're nuts when we tell them *Rebecca* has spotted us a six-hour handicap. "You'll need two days the way they are moving." She must be a very impressive sight close aboard, but we are too far away to appreciate the grandeur.

Beowulf with her two free-flying reachers set (below). This is an easy-to-handle and powerful rig, and we're flying almost 4,000 square feet of sail.

van der Wal/Stock Newport

Rebecca, smoking on a power reach. She has a lovely sheer line, and the almost flush deck arrangement is exquisite. Compared to the other mega-yachts, most of which look like wedding cakes (with layer after layer of deck structure) we think she is a thing of beauty.

Tuesday, May 23, 0800. 35deg 00min N/67deg 25min W. We're power-reaching right now with working sails. Wind is just ahead of the beam at 22/25 knots. Surface analysis shows us about 50 miles from a cold front—which was supposed to go north of us, so we're expecting perhaps gale force winds for a short period—and then a shift to the northwest—on the nose—which should quickly go around to southwest again. *Rebecca* is hanging in there, about 10 miles back on radar. We've just noticed a big squall line on radar, about 10 miles ahead. Towering cumulonimbus clouds indicate some real squall activity. We think we'll put the jib away until we see what happens.

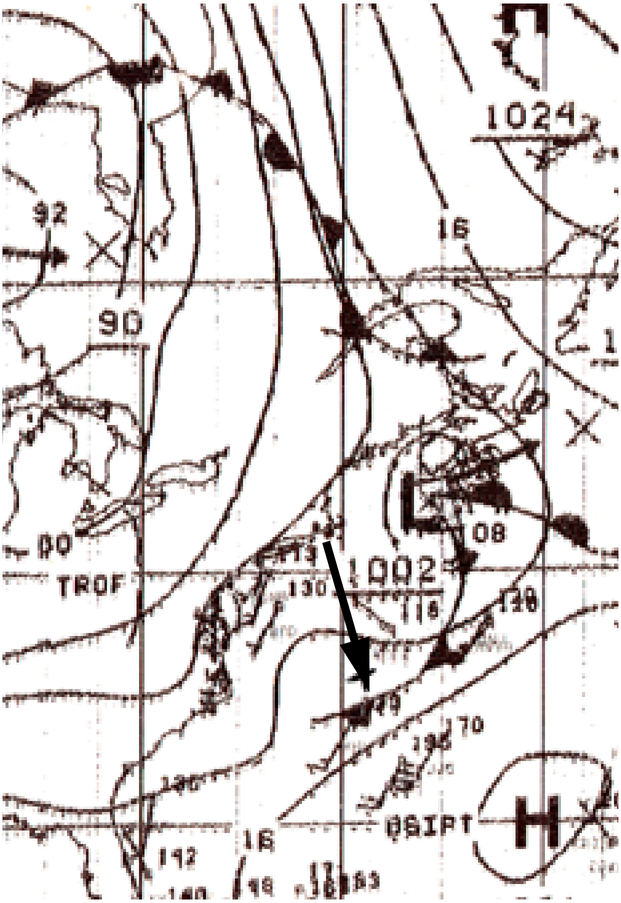
Barometer has begun to rise, but this does not look like a cold front—yet. Cancel the last statement—classic roll cloud leading edge once we're underneath. Very nasty looking. Abrupt wind shift 30-degrees to northwest so we're hard on the wind for our waypoint to cross the Gulf Stream.

Rebecca has spoken with Ken Campbell at Commander's Weather and he says this is the front, not much wind behind it, with a rapid shift back to the southwest and wind building to the 30s. No real increase here—yet. If we do get that shift sooner rather than later, we're going to have one fast trip as the angle to Newport, once we cross the Gulf Stream, is about 20-degrees further aft. Surf City here we come (we hope)!

0900. Lots of exciting looking clouds—you could easily be intimidated—but no wind to speak of, not that we're complaining mind you! Have unrolled the working jib and we're just fetching our waypoint to cross the Gulf Stream, still on port tack.

We've called *Rebecca* to advise them of what we've found wind-wise, in case they want to shorten down.

Help



"We've been watching the front on radar" comes the reply. "We've got the mizzen reefed and the jib rolled up, and are motorsailing right now to windward. We're watching you on radar. You must be powering faster than we are as you're getting away from us a bit."

Do we tell them that we've rolled our jib and are *sailing* with main and mizzen—and no engine? Yeah, might as well rub it in subtly—odds are they'll catch us later anyway.

This is the first time we've played in the Stream in many years, so we're a little rusty on the best tactics. However, there are a couple of basic cruising rules. First, avoid the Gulf Stream in frontal weather. The increased warmth and humidity add energy to whatever weather is above and downwind. Squalls are much more intense and a general heightening of wind strength is typical—although not always well forecast by computer models.

Frontal passage roll cloud. On this page looking off to the west, and on the opposite page to the east.

Seeing this rapidly approaching the prudent thing to do is shorten down, just in case. We didn't get much of a bang this time, however.

The fax chart opposite is the morning surface analysis, i.e. what the MPC thinks is actually happening now. The heavy black arrow points to our position. You can see the cold front just to the east of us. They have this front within a few miles of where it should be—not bad.

The second issue is the sea state. The edges of the Stream are quite defined, much like the edges of differing air masses. As such they provide a type of wall, and wave systems can be trapped with these walls, bouncing back and forth, creating very uncomfortable and/or chaotic conditions. You also have the issue of current opposing wind and wave which results in much steeper than normal waves.

Along with the meandering (riverbed-like) flow of the main axis of the Gulf Stream, there are warm and cold eddies spinning on the sides. These are analogous to highs and lows in the atmosphere. The warm eddies spin clockwise as do high pressure systems, while the cold eddies spin counterclockwise, like low pressure systems.

Even in a vessel as powerful as *Beowulf*, we would avoid crossing the stream in frontal weather conditions. However, for this passage it appears that is not an issue as we should be almost to Newport (maybe even anchored) when the next system crosses our path.

From the Gulf Stream chart we picked up in Bermuda, and from Commander's Weather, we have an entry point to cross the Stream somewhat to the west of our rhumb line course to Newport. The exit point is almost right on course—so we're losing only 25 miles or so to cross at a narrow spot. If we were 20 miles to the east, we'd be in the stream for a hundred plus miles, instead of the 45 or so this will entail.

1006. Another squall line on radar and in the sky. Barometer is dropping. Roll up jib and get ready. Wind shifts abruptly 30-degrees to the right—west, but drops to 15 knots rather than increases.

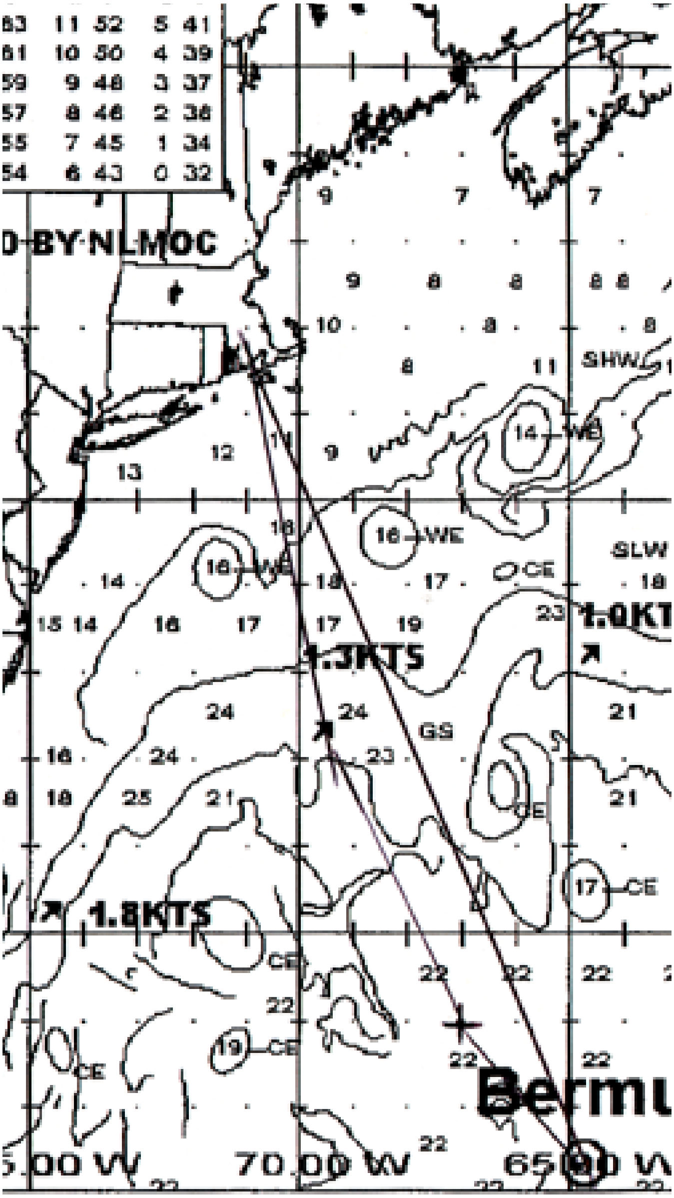
1144. Wind back to southwest 18, sky is clearing ahead, and sea state is sloppy. *Beowulf* is powering along with working canvas and two tons of water ballast. She wants to run at 14 knots, but she'll get accelerated

Help

The Gulf Stream chart (updated every three days) from the Bermuda Weather Service and available from Bermuda Custom's service. Our course is roughly laid out below. The southern (doglegged) course is what we're planning on using. The rhumb line shows how little difference there is in actual distance—but look at the difference in time spent in the stream between these two slightly different approaches.

Temperatures are given in degrees C. The notation "CE" stands for cold eddy while "WE" stands for warm eddy.

Note: warm eddies spin clockwise and cold eddies spin counterclockwise.



and then a minute later get slowed by a crossing sea, so we're probably averaging only 12 or so. *Rebecca* is holding behind us about 12 miles. We seem pretty evenly matched and it is a good chance for us to check the effect of sail trim and ballast. If trim is off a bit, she begins to catch us—particularly if we are oversheeted.

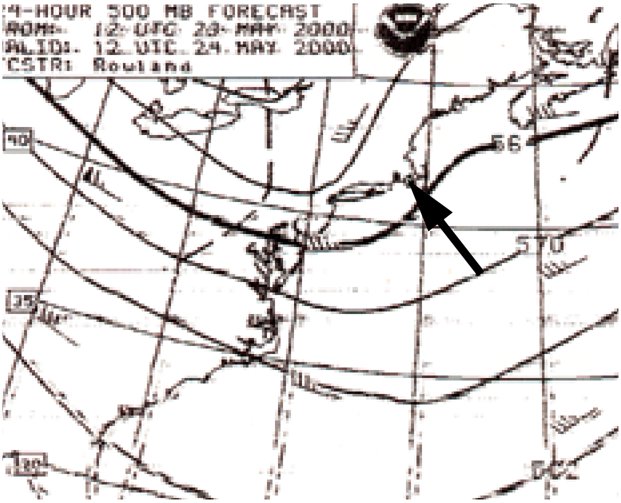
1200. Just received the current (4 hours old) surface analysis on the fax. If you move it forward a couple of hours, they have the front exactly right. We've got roughly 385 miles to go.

1530. Still making good progress, with 340 miles to go. If we average 11 knots from here, we'll get in at 2130 Wednesday. If we can maintain 12.5 knots, easy to do if the wind picks up and stays southwest, we'd be in by 1830.

1610. Spoke with *Rebecca*. They are 12 miles behind us and to leeward, doing steady 13 to 14 in 20-24 knots of wind—while we're slowing down in lighter airs. Another squall line ahead on radar. Not as intense-looking, but wider areas of light showers showing up. Have to see if our lighter winds are general and we're ahead so in them first, or they have a better slant of wind.

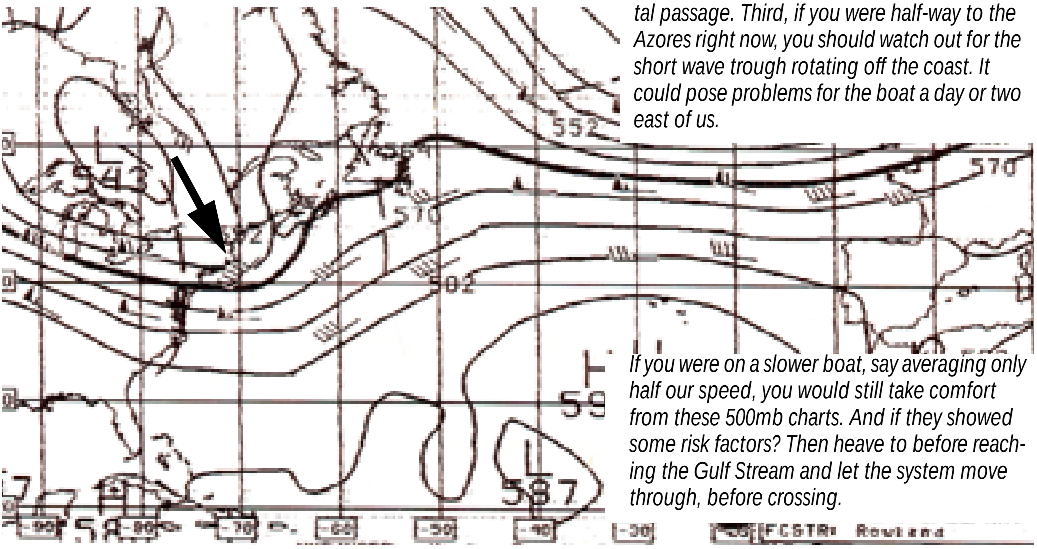
1800. 36deg 23min N/69deg W. Wind southwest down to 8-10. *Rebecca* has stopped gaining on us, so the lighter winds are area-wide.

Help

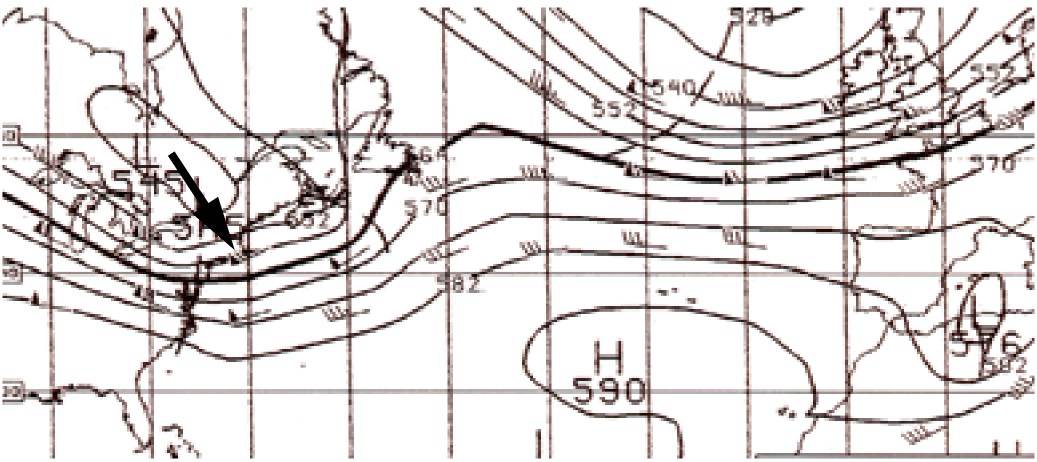


We talked earlier about risk awareness and avoidance. The first place to begin to check is on the 500mb charts. These three charts are from the morning of May 23, 2000. The top chart is a 24-hour forecast, the middle a 36-hour, and the bottom a 48-hour. There is nothing on any of these to indicate other than perhaps a modest front. Keep in mind that the 500mb charts are pure computer output—no human intervention is involved (unlike the surface chart which gets lots of manipulation). Therefore you have to take these with a grain of salt. But if you've been watching them for some time a pattern will develop, and you'll notice when the computer seems to be getting it wrong.

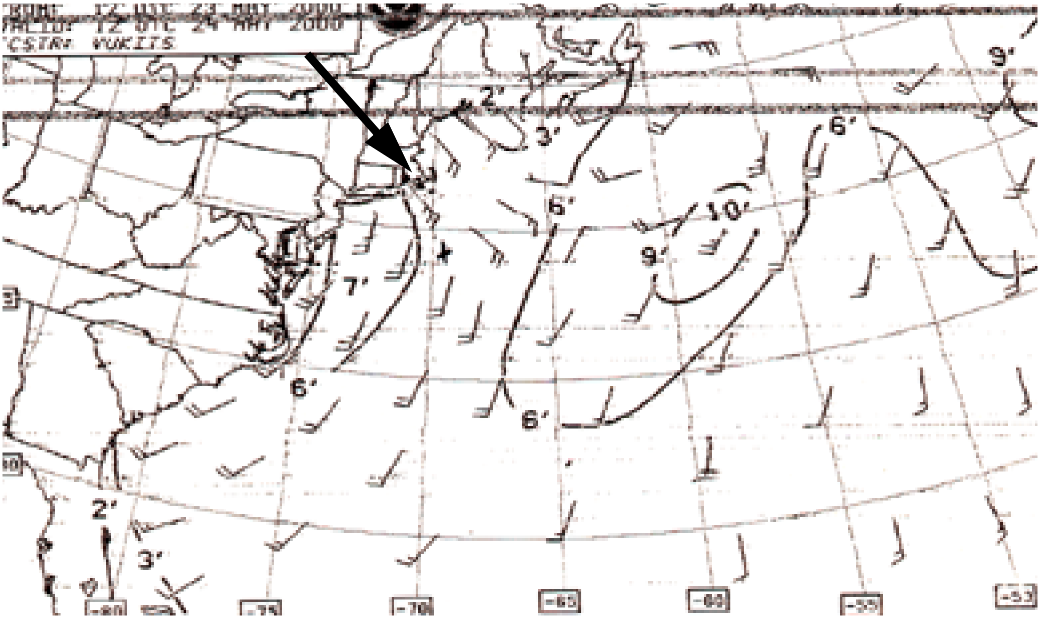
There are three key things of which to take note on these. First, the Hudson Bay system we've been concerned with is not going to affect us. Second, we might have a small frontal passage. Third, if you were half-way to the Azores right now, you should watch out for the short wave trough rotating off the coast. It could pose problems for the boat a day or two east of us.



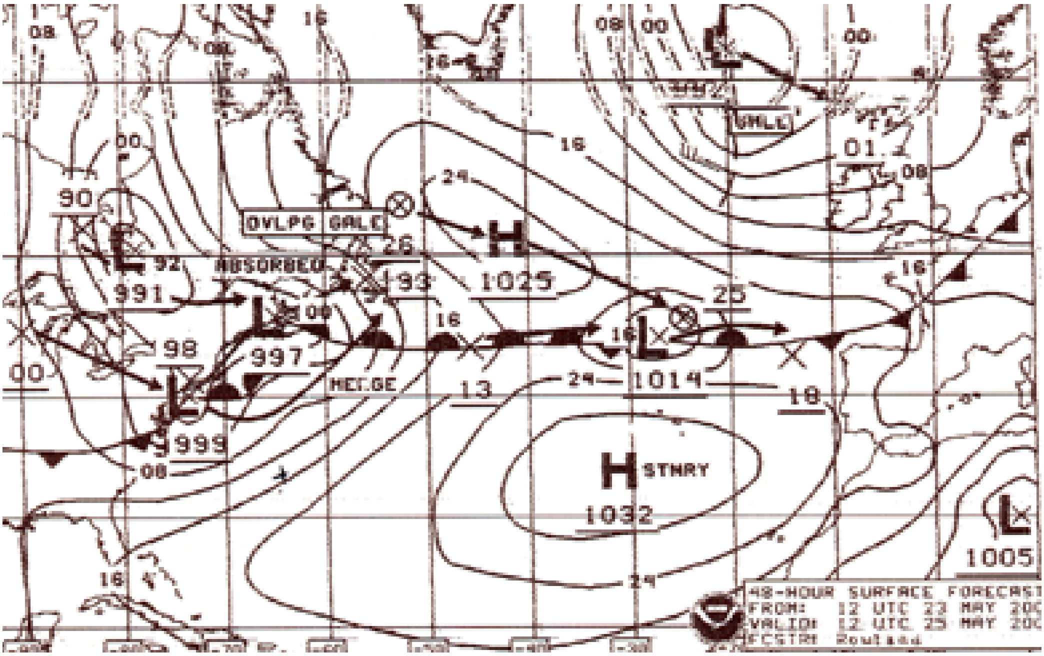
If you were on a slower boat, say averaging only half our speed, you would still take comfort from these 500mb charts. And if they showed some risk factors? Then heave to before reaching the Gulf Stream and let the system move through, before crossing.



Help



Here are two surface forecasts received at the same time. Above is the 24-hour prognosis, by which time we should be closing with the coast. Below is the 48-hour, at which point we will hopefully be anchored. Both show a pretty steady southwesterly flow forecast between the Azores/Bermuda high to the east and the oncoming moderate low pressure system to the west. In theory, well have some compression between these systems which will increase the pressure gradient and surface level winds. The one minor concern is if the low pressure system beats us to Newport, in which case we'll be faced with beating—something we'd rather avoid. So, based on what we see here we're going to push with the engine if our speed drops below nine knots. Note the fun and games forecast to develop to the east around 20 west and 50 north, as the 500mb trough develops an associated surface low. This will be something to watch if you're headed towards Europe.



Help

Gulf Stream Crossing

Wednesday, May 24, 0015. Hit the first waypoint for Gulf Stream. No temperature change and still adverse current.

0130. Now we're in it for sure. Water temperature is up eight degrees Fahrenheit, no major current effect except a set to the east. Breeze is south-southwest at 15 knots so we're starting to pick up speed. This is forecast to build to 30 knots, gusting 40 as the day wears on. That should provide a nice ride! Sea state quite mild and very balmy outside. We're still sleeping under a light blanket, wearing shorts and T-shirts. GPS says 34 miles to go until the next waypoint on other edge of stream. Bet the air temperature changes then (our cold weather clothes—including thermal underwear, are ready to go).

Unless the wind picks up quickly or goes somewhat forward, there is now little chance of getting into Newport for dinner. We have not been able to raise *Rebecca* in VHF. Hopefully this is because she is way behind—but then she could be way ahead, if she has done a better job with getting a favorable push from the Stream. Her position to leeward also gives her a better (closer) reaching angle in the current breeze—which is too deep for our liking at 150-degrees true. Isolated squalls dot the radar at the 48-mile range, nothing looks ominously shaped. Still, we're avoiding them in deference to the Gulf Stream's potential.

0230. We must be in the southeast meander of the Gulf Stream we are trying to avoid. Current is knocking 2 knots off our speed and pushing us southeast so that our course is adjusted about 20-degrees to the northwest (we're steering 345-degrees magnetic making 002-degrees true). Water temp now up 9.5 degrees Fahrenheit and more isolated squalls are showing up on radar. Thirty miles to go until we're out of the stream. Hopefully we'll be clear before the early morning round of squall activity begins to kick in.

0300. Radar shows two lines of squalls, about 40 miles across, ahead of us. Lightning is beginning to show ahead of us. Don't see how we can avoid these, but perhaps heading up will help.

0310. Squalls building on radar—however for now we are not getting any closer. They are about two miles ahead, about where the edge of the Gulf Stream lies. On deck, overhead, it is clear, and a lovely canopy of stars quilts the sky. Lots of cloud-to-cloud lightning ahead, but we do not see any water strikes—yet (and we hope it stays that way!).

0330. Breeze puffing into low 20s, but averaging 18 from south. We're flying the reaching jib off the bowsprit, main and mizzen. We'll wait until we're out of the stream for the mizzen genoa. The barometer has been steadily dropping since mid morning. From a high of 1017 it is now 1005. If we didn't have fax charts to tell us what was happening, this would be a definite indicator something was on the way. We are still losing a couple of knots to the current.

0350. Closing with squall line—now just 10 miles ahead and we are starting to see a few water strikes of lightning. We have rolled away the big reacher and are proceeding under main and mizzen until we know how much (if any) wind increase there is. During the day you could get some warning with wind on the water but at night the only warning will come from a sudden drop in temperature—and that's often only 30 seconds to a minute. If we were in the trades we'd probably carry the reacher right through the squalls—but here we are forced to respect the potential of the Gulf Stream heat machine.

0530. Still fussing with the squall line, now in the northwest corner.We had a 120-degree windshift, and a quick increase in wind to 25 knots, but it is down now to 9. Water strikes of lightning on port bow. In theory, metal boats have a lower likelihood of getting hit as they bleed off the ion charge necessary to create a leader for the cloud's energy to travel down. Still, it is always a little uncomfortable when you see that energy whacking the water nearby!

Water temperature has dropped 8 degrees Fahrenheit in the past 20 minutes, so I'd say we're on the edge of the stream.

Into Cold Water

0600. According to our waypoints we are now out of the Gulf Stream.

After a couple of hikes to 25 knots from southwest to northwest, wind is back in southwest at 10 knots. We can see clear spots in the sky to the west although to the east and directly overhead it is still raining. The sea state has moderated considerably, probably because of the lack of opposing current. Boat speed and speed over ground are equal for the first time in a long while.

Now we wait on the southwest wind to fill back in. Meanwhile, *Rebecca* is 15 miles or so to leeward and just behind us. If the wind stays deep behind us, her position gives her a much better angle to Newport with the wind further forward. That could be a problem. We are now 209 miles to the sea buoy off Newport.

We have not received weatherfaxes for awhile, so we are not sure what to expect in the way of timing for the next front. As we have gotten progressively closer to the Coast Guard station (NMF) in Boston we've had to lower the receiving frequencies. In the West Indies 12 mHz worked the best. In Bermuda it was 9 mHz most of the time. For most of this passage we've been using 6 mHz and just now we've started to pick up NMF on 4 mHz.

0615. Clear skies, no rain, and no wind.

Wednesday, May 24, 0830. Distance to go: 184 miles, and there is a large line of squalls developing behind us. Another is moving offshore up in the northwest corner of the radar. We offset the screen of our 48-mile Furuno and can see weather 80 to 90 miles in whatever direction we offset. At long distance we use the electronic target enhancement feature and additional gain to see rain bands. The big question now is: are these from the warm front, and can we get on top (north) of it? If so, we'll get the clocking winds going to the southwest (right now it's from the south—right up the stern—which we do not like). If we're below the warm front, the winds will prob-

ably back to the southeast, then on through northeast, which is okay as long as it doesn't go northeast too soon; i.e., we do not want to be on the wind.

0900. 176 miles to go. There is a huge long rain band/oriented southwest to northeast coming off the coast at us. It must be 100 miles long. We've furled the cockpit awning for the first time since we left California, and

A classic looking warm front sky above and the associated rain bands on the radar below.

Help

A close-up of the radar screen. It is set on 16 miles, and we have the digital target enhancement feature turned on—which in this case makes the rain bands look more prominent. Beowulf is in the center of this image. The rain band stretches from the west to the east directly across our course. Short of heaving to and waiting for it to pass, the best approach is to keep moving.

However, if we were aboard a fiberglass vessel, with higher lightning risk, we'd be tempted to wait it out, and then proceed.

rolled up the big reacher and are proceeding with just main and mizzen, until we see what is involved in the way of thunderstorms with what's coming.

0953. 166 miles to go. We are almost enveloped by this huge thunderstorm (or small warm front) on the radar. The sky is ragged and ominous looking to the west, and we are starting to see cloud-to-cloud lightning. Wind remains from south-southwest, now at 16 knots. This is a very defined area on the radar with a precise clearing past the northern edges.

0957. Breeze is picking up—now 22 knots. We just saw a water strike of lightning ahead and to starboard a few miles off.

1004. Wind has gone to 205-degrees true and is blowing 25 knots. Moderate rain.

1012. Wind up to 30 knots. We're doing a steady 16 knots with just main and mizzen. Lots of lightning in the clouds. The cloud now seems to be traveling with us so, as the wind seems to be southwest, we're going to head more west and see if we can get out. If it weren't for the lightning, we'd stay in it for the breeze, however.

1024. Wind is down to 12 knots but we're still enveloped. Engine is on and we're motorsailing on a northwest heading to try to get clear. Another line of squalls is forming on the radar to the west northwest.

1031. We're working our way out now. Rain has stopped. Breeze settled down now out of the southwest at 15 knots—a much better angle than before this squall or warm front. We are going to wait another 15 minutes to decide on what headsails to carry. *Rebecca* probably has two spinnakers up right now!

1050. A patch of blue to the west and a school of porpoise are welcoming us to New England. In the meantime, we've just had an e-mail from Newport saying it is rainy and 45 to 50 degrees Fahrenheit. Not sure if our bodies are up to this! Tried calling *Rebecca* on VHF. No answer. They're probably out of range—which is hard to imagine between our two mastheads (especially theirs!). They may have slipped by us, or maybe they're further behind. Guess we'll find out when we get to Newport!

Wednesday, May 24, 1400. 117 miles to go. We're surrounded by blue sky, the wind is backing now firmly in the southwest, but still light at ten knots, Sea state is calm and the barometer is up 2mb at 1003 in the last couple of hours. If it weren't for the faxes, and persistent haziness, we'd not believe this business of another gale in the next 24 hours. The sun is hot in the pilot house. But outside you definitely know the wind is blowing over cold water—it is decidedly nippy. Mizzen genoa and big reacher plus the main and mizzen are pulling us along at wind speed while we await the sleigh ride promised by the forecasters.

1520. 108 miles to go. That haziness has turned to...FOG. For tropical cruisers this is something of an anomaly. It sure nice to have a radar with really good target definition! The wind has clocked all the way to the northwest. If it doesn't go any further we can just fetch Newport on port tack. Meanwhile, we're pushing hard to get into port before this turns into a hard beat.

1900. 68 miles to go. The fog has lifted, and it is sunny and warm inside the pilot house. On deck we are wearing a lot of the Patagonia warm clothing we traded for their use of a photo of *Beowulf*. In the engine room there is a coating of condensation on the hull. Water temperature has dropped 18 degrees Fahrenheit from the Gulf Stream!

The chamber of commerce didn't say anything about this! We're charging along here unable to see an eighth-mile into the fog. We're really glad we have that open array antenna on the radar for good target definition.

Wind has gone back to the southwest, but stayed light. We're pushing, motorsailing at 11.5 knots so we can beat the next front, due in the morning.

There's also another batch of semi-strong thunderstorms supposed to work their way offshore later on this evening—which we'd just as soon miss.

2000. 57.5 miles to go. We picked up the VHF weather broadcast, so we must be getting close to civilization. Dinner in the pilot house (pasta, salad, hot sourdough bread) is interrupted with a series of non-moving radar targets arrayed across our path. We go close by one and they are some form of fishing boat marker: a radar reflecting flag tied to a float.

VHF weather is issuing a series of severe thunderstorm warnings for New York, Connecticut, and New Jersey. The sky to the west looks like somebody in the cloud control room cannot make up his mind what he/she

Help

Right: These are fish net (or trap) markers, laid out in a line on the radar. We started picking these up at six to eight miles. However, if any sea had been running the odds are they would have been lost in sea clutter.

Once we realized we had something unusual, the digital signal enhancement was turned off to try to get a feel for what we were looking at. With the enhancement on, there is so much sea clutter (it strengthens those signals too) that it is hard to pick out weak images. The radar is now set at the three-mile range.

Below is a close-up of one of these markers. They show up quite well considering the small size and low height.

wants to do so they are pushing all the buttons. Meanwhile, down here on the surface, wind remains SW at eight knots. The barometer is steady at 1001. And the water temperature? Down another three degrees to 57-degrees Fahrenheit. The diesel heater is now officially in operation.

2130. 41 miles to go. We started listening to New York City news radio—after the first ten minutes decided it was too depressing. There are a few isolated thunderstorms, but nothing to be excited about. We started thinking about what we need to do after clearing customs. The to-do list is pretty short for *Beowulf*. But for her crew...let's think about that later.

2330. 20 miles go. Wind just shifted to west northwest so we are close reaching in 8 to 9 knots of breeze, with the engine going and working canvas. Block Island shows up at 24 miles on radar—but we cannot see any of the coast even at 48 miles. If we didn't have Block Island, a small boat to port, and a sea buoy all giving us returns you would think something was wrong with the radar. The land mass must be much lower than we remember.

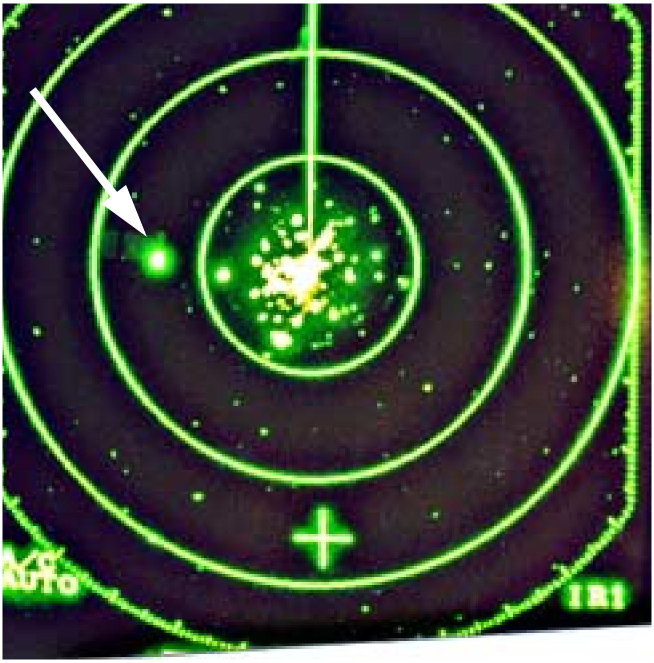
2345. Passing abeam of Buoy "A." Radar confirms GPS chart position—once we get a couple of other confirmations of the electronic chart accuracy, we'll be more comfortable with using it to enter the harbor. Radar will be our first choice, however. This is a RACON buoy which means it has a transponder which responds to our radar signal and sends out a long line aimed at us, so that it is easy to identify.

Thursday, May 25, 0116. We're abeam red #2 buoy off the entrance to Newport.

0118. The Nobletec navigation program locks the computer just as we're entering the narrowest part of Narragansett Bay! It pays to have radar, which is our primary nav tool now, anyway. And paper charts.

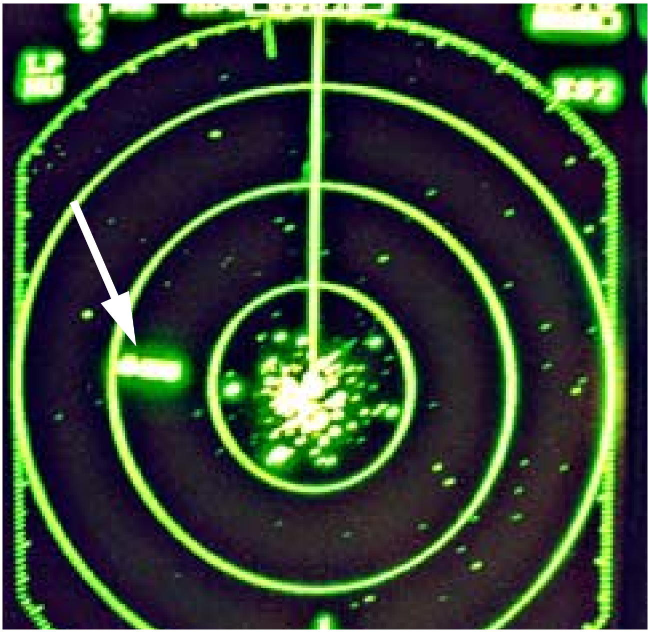
0221. Anchor is down, decks are cleared of their spaghetti, and light sails are stowed. Sixty hours for 658 miles of sailing—slow by our standards, but safe and comfortable. *Rebecca* is nowhere to be seen, and so ends this voyage.

PS: *Rebecca* moored just before 0800, a little over 5.5 hours behind us.



Two radar views of the Newport sea buoy, in normal mode above, and with its RACON transponder responding to our radar's transmissions (white arrows indicate buoy).

These RACON buoys are often found at the entrance to major ports and on oil drilling rigs. The long shape is actually a dashed line (which does not show up in the photo) and points at the radar which has triggered its signal.



Help

Richard Bennett

The Australian yacht Kingurra on her way across the Bass Straits, towards Tasmania.

She's fighting her way uphill in a moderate gale—the perfect conditions to go out and test the boat and crew.

STORM TACTICS

The best way to deal with storm tactics is to avoid the need for them entirely. If you keep an eye on the weather cycles and the conditions that exist in your current season, don't be rushed by schedules, and maintain your speed while on passage, the odds of encountering truly severe weather are in your favor.

Take our own experience for example. We've sailed well over 200,000 miles now including numerous trips around inhospitable places like Cape Hatteras, Cape of Good Hope and Cape Agulhas, between tropics and New Zealand (or the other way around) numerous times, with plenty of passages in warm currents like the Agulhas. In all of this time we've been in two blows that had the potential to be dangerous, although we suffered no damage in either.

Consider now that a majority of the time we spent potentially at risk to the elements were during an era when weather forecasting was far less reliable than today, faxes were rare, and satellite data almost unknown to the mariner.

What we're trying to say is that the risks of getting caught in something dangerous to a well found and properly handled yacht are minimal.

On the other hand, there is plenty of evidence of boats and people occasionally being lost to the elements.

When we were doing our research for our last book, *Surviving the Storm: Coastal and Offshore Tactics*, we were struck by a common theme repeated over and over. In every case where there was major damage, loss of a vessel or loss of life, the problems could have been avoided.

What we want to do now, in this section of *Practical Seamanship, is* review the common factors you need to understand to stay out of the trouble.

What Is Heavy Weather?

Truly dangerous heavy weather is extremely rare. And it's not the wind which is the problem, but the seas. You can handle 60, 70, or even 80 knots of wind in some fashion or another. But the sea raised by a 40-knot breeze blowing against a two-knot current can cause all sorts of grief.

Until you've experienced a gale, it is something that is feared. Then once you've been caught out in a gale, and dealt with it you think "That wasn't too bad. We can handle that and the boat did just fine."

The anxiety level for skipper and crew goes up a notch.

Then, eventually you are in storm force conditions. If the systems and rig hang in there, and they will if properly maintained, odds are you'll come through with some interesting experience, and be well prepared for authentically dangerous conditions if you are ever caught.

The trick is to understand the difference between truly dangerous conditions, and those which provide a chance to test yourself, your crew, and your boat.

Everyone who goes to sea worries about getting caught. Even the most experienced professionals have that little tinge of apprehension as the weather starts to change. This is a healthy reaction, as long as it leads to caution. If it leads to fear and paralysis—inactivity—then it is a real detriment to safety of vessel and crew. And if that fear nags at you whenever it is time to head offshore, it will put a real damper on the enjoyment of cruising.

Preparing For the Worst

So how, without direct experience, does one work around this? Our suggestion is to make two things a priority when you are getting ready to head offshore.

At the risk of seeming redundant, the first is to make whatever effort is required to understand weather. Being able to analyze what is happening around you, and forecast the near and medium term future is a key to staying out of trouble in the first place, and to using the correct tactics if you are caught. There is simply nothing else you can do with time or budget—both of which are always in short supply when it is getting close to a departure date—that will make your cruising safer or more comfortable.

The second factor is to make a priority of preparing the boat and yourself for heavy weather. This applies to storm canvas, any drogue devices that may be used, reefing systems, as well as how to use this gear in adverse conditions.

Practice steering the boat in boisterous conditions, when it may be more pleasant to allow self-steering to do the job, so the crew understands what to do in conditions where the vane or pilot may not get the job done.

Chain Reactions

The majority of all heavy-weather disasters start with some small thing going wrong. This leads to a temporary incapacity of the vessel. Perhaps steering is lost, or the rig is compromised. The crew is then unable to control the boat properly and she gets knocked down or rolled by a big sea. Or maybe the crew is just worn out trying to cope with the maintenance issues and doesn't have the energy left to think or act clearly.

Most cruising boats have continuing maintenance issues. The key is to not let them get to the point where they could incapacitate the boat in heavy weather. Often, seemingly small issues in moderate conditions become far more serious in a storm.

Maybe it's the steering cables. There are a couple of meat hooks near the swages at the quadrant. You'll change them in a couple of months. But if they fail in a storm, with breaking seas, what happens then?

There are really no special precautions to take for heavy weather. It is just the same old day in and day out maintenance which is part of voyaging. Stay ahead of it and the odds tilt heavily in your favor, if you are caught out.

Tactics

Rule number one in heavy-weather tactics: there is no magic bullet. The best tactics to use depend on the vessel, sea state, where you lie relative to the storm system, and what is the best escape route. The mix of crew skill and endurance also plays heavily in making the correct decision.

There are times when passive tactics work well, or are the only available choice. And there are other situations in which taking an active part in the defense of the vessel is by far the best approach.

In the early parts of the storm often the best thing to do is to push hard to get away from the most dangerous area. This may mean a change in destination, or heaving to for a day or two until the situation has clarified itself. Obviously, understanding the risk factors of a given weather scenario play a big part in this decision making process.

Keep in mind that with tropical storms the difference between winds of 100 knots and 35 knots is often a distance of 50 or less miles. Even with larger extratropical (high latitude) systems, a couple of hundred miles can make a huge difference in conditions.

There is almost always a course which even if it doesn't get you out of a dangerous area, will take you through it faster.

The opposite to all of this is also true. There will be courses which take you more into danger, and/or keep the boat trapped in the difficult conditions for longer periods of time.

Understanding what is causing the weather system, and where its center lies, is the key to all of this—and the ability to ferret out this data is not that difficult to come by.

If You Are Caught

Okay. Let's say there's a blow coming at you and there's nothing to be done about it. What do you do?

Weather Analysis

The first step is to keep a written log of the weather. Note the barometric readings, wind direction and velocity, cloud type and direction, and sea state.

This written data will show you the trends in the weather, and that is the key to deciphering what to do. If outside data—faxes or voice—is available, compare that to what is being seen aboard. If there is a difference in actual and forecast conditions figure out what could be causing the change. And as we've said before, when your onboard analysis varies from that which comes from an external source, it is almost always better to stay with your own reasoning.

Next, write up in the log what you think is happening and why, and what you expect next. It helps to put in target wind direction and speeds and barometric pressures, along with the time these targets are expected.

These notes, together with the actual conditions, are then reviewed periodically. Aside from keeping the crew mentally occupied, the odds are you will detect changes from what is forecast more quickly with this method.

Most folks cruise in company, often with large fleets. Chatting on the radio is fun, helps to pass the time, and a measure of confidence is gained by knowing there are friends and potential help nearby.

But when it comes to weather and storm tactics, the herd is often wrong. Just because the other boats are taking a given approach, does not make it correct. If you feel in your gut there is a better approach, it often is best to go your own way.

On Deck

Hopefully, everything that needs to be done for heavy weather will have been done before leaving harbor. But just in case, double-check rig and rigging (see page 20), make sure all lashings on dinghies and life rafts are secure, and remove anything that can be brought below.

If there are fuel or water jugs stored on deck and they cannot be brought below, consider getting rid of them.

Have storm canvas ready to go, and double check that sheets are well secured and properly lead (we like to sew a seizing on any knots).

Remove and seal vents. Make sure cockpit lockers are sealed and securely locked.

Below

Secure floorboards, bunk and seat cushions, books and loose gear. Have easy-to-prepare meals ready to go. Keeping the crew well rested, fed and hydrated is important in maintaining energy levels.

Make sure washboards and sliding hatches are locked.

Crew Duties

There are always going to be some in the crew that are more skilled at handling the helm than others. In the initial phases of the blow it usually works best to have the less-skilled steering, while the other(s) rest. Those who have the most ability to handle the boat in heavy going should husband their energy.

Help

John Lawler

"The crew of a big boat tends not to increase in number proportionately with the size of boat. Automated systems allow huge amounts of sail to be handled with fewer crew—when it all works. There is nothing like a 130-foot (39-meter) 225-ton sloop doing 18 knots... the power needed to achieve such speeds are enormous.

"The risk of breakages is even greater. The risks are so high that I have only felt comfortable pushing that hard twice in my career. In a racing boat you go that hard all the time, but racing is different to a charter boat.

"It may sound very corny, but the Irving Johnson story and "Voyage of Peking" is something I've watched possibly a hundred times. A wise old fella was Irving, but there was one thing he said which has stuck with me ever since and I keep telling it to my crews. 'Check and re-check, make sure things are right ahead of time...' I take this to mean if you see a problem, fix it, don't ever wait for the next guy...don't walk past something that is not done in the proper fashion. I only set the full mainsail on *Mirabella* on a nice day with stable conditions. That way I can handle every eventuality with minimum risk to passengers and crew or damage to the boat's rig and sails."

John Lawler has been sailing since he was four years old (in Sydney, Australia). He became a professional sailor after graduating from high school eighteen years ago. He is a shipwright by trade and has now covered well over 300,000 miles at sea in boats ranging from 30 to 175 feet (9.1 to 53.3 meters).

John started at the bottom, as do most of the professionals we know, and worked his way to the top, He has raced or cruised on everything from Sydney Harbor 18s to maxi racers like *Condor*, *Ragamuffin*, and *Nirvana*. He has been captain of the 175-foot (53.3-meter) schooner *Aquarius* and the 131-foot (39.9-meter) Bruce Farr sloop *Mirabella*.

Pre-Departure Preparations

I divide my boat into areas (e.g., engine room, rig, lazarette, bilges, storage areas, galley and food, bo'sun's locker) and each has a standard check list for pre-sea departure. A crewmember is delegated responsibility for a certain area, whether at sea or in the harbor. Spot checks (by the skipper) are the main way of achieving the required standard. It also helps if I stop the work any day at random and tell the guys "Okay, go to your areas and tidy up, take stock and let me know what we are short on."

With a crew of widely varying specialties and capabilities, I like the Swedish watch system (two watches with 6/6 days, 3/3 night) run with three separate watch teams. It revolves that one watch is not on the rota and this watch works a normal 0800-1700 workday weather permitting. This "stand-by" watch does the crew mess and galley chores and is always available at night for sail handling.

There is always a watch leader with a suitable qualification, who should teach and tutor their watch partners until they are at a proper standard to be of use as a watchkeeper. If they fail to grasp basic navigation and COLREG principals, they may not be asked back...

Standing Orders

I leave standing orders posted in the wheelhouse: "I am to be woken if *ever* you are unsure of anything. Wake me if anything changes appreciably: wind direction, speed, swell, squall lines, heavy traffic, unrecognizable nav lights and so on." I don't do a watch and tend to "float" and be there when I am needed in bad weather, traffic areas or hazardous navigation areas. I'm always rested, so there is no excuse not to wake me at a moment's notice.

I believe as the captain it is my privilege to make the final decision. I should be involved in any discussion involving the passage and matters of shipboard well-being. I involve the more senior crew in all decisions such as heavy weather tactics. I encourage their input under all circumstances. I try to learn something every day. But I have been around a bit now and I am coming to know what does and doesn't work.

In my opinion, anyone who leaves protected waters should have a Sea Survival certificate and a First Aid certificate of a proper standard. Being at sea under duress becomes a team effort when things go wrong. The captain, while responsible for everything, shouldn't have to baby-sit crew who submit themselves as capable to a basic level, who are not, and have no other attribute than a desire to be on the sea.

A captain should in every case have drills at regular intervals (monthly) to check and re-check equipment, retain familiarity with equipment locations, and generally keep safety in the front of people's minds, not the back. I discuss MOB tactics, then practice them, in all conditions.

In Heavy Going

You asked how to handle big boats in a blow. I'm talking 50-plus knots in 115-foot(35-meter) boats or bigger. I think the key is slowly. With less than 45 knots of wind, by virtue of their size and displacement, they can look after themselves. Much above that it seems to me that the laws of physics come into play and loads and stresses seem to increase exponentially.

If it's blowing 60 knots, with 25- to 30-foot (7.6- to 9-meter) seas, very cold dense wind and we're in *Mirabella* I keep the speed off, and just maintain steerage. Running away in large boats is too dangerous. The speeds you will achieve with a huge waterline length will be in excess of theoretical hull speed, and broaching is an ever-present risk. The loads on steering gear trying to pull a 225-ton boat out of a broach are inconceivable to me. Autopilots struggle and are generally too slow in these conditions, and downwind helmsman are rare on charter boats. If you bust your steering or simply wipeout, you will broach and in really bad weather that will almost certainly lead to a whole other set of problems. A few extreme examples are water pouring in through vents, which then runs into the engine room, or drips on the main switchboard, fire, power outages, and then your steering's broken...

Streaming warps and sea anchors are of no use. Gear of adequate size would be too heavy to handle by a small crew. Think of the practicalities of handling a two-inch (51-millimeter) warp 300-feet (91.4-meter) long, wet; put a big parachute on one end of it and try to attach the other end somewhere. I can see life and limb lost; deploying such a device on a big boat would be very difficult with two deck crew.

The method I use for *Mirabella* is to set a storm jib sheeted as close to center line as I can. This serves to heel the boat over just enough to not fall off the wave; rather it pushes you to leeward with the wave. I have engine revs set for steerage, to find a nice angle of attack for the prevailing seas. The worst of the breaking waves tend to slop on board, but with little force, if you're going slow! With your slight angle of heel from the storm jib, the water runs away quite quickly.

"I use routers, as the insurance companies make me. They are good. But, a vessel needs to be able to operate between 12-18 knots (boatspeed) to be successfully routed with weather patterns. Unless you can speed up and slow down between those speeds, forget the myth of a two-sail reach for weeks on end. If your boat's slower than that, weather systems will catch you and roll on through. The routers mainly offer a forecast, which means you'll get 12-24 hours accurate prediction. (I think when people dislike routers, the router is actually correct; it's the guy that's looking at a gale who doesn't like what he's reading. It's like shooting the messenger who brings the bad news.)

"I will take 12-24 hours notice of bad weather any time. It gives me time to make sure things are right ahead of time: bend on storm sails, double check lashings, prepare easily cooked food, stow all loose equipment, check harnesses, strobes and so on."

The captain has to find the course, sail configuration, and engine revs that takes load off his rig, steering, windows, hatches, and stern gear and then ride it out. Play around until you find where the vessel feels the safest. Wave frequency, pitch, and size can vary from hour to hour, so constant vigilance is needed to keep the boat riding nicely.

I lost my father in the Sydney-Hobart Yacht Race in 1998. He sailed aboard the *Winston Churchill.* I take safety and heavy weather tactics very seriously. Had those souls and indeed every competitor taken conditions a little more seriously, many would not have perished. Had they had basic survival training, they would not have so endangered the rescue personnel and themselves. They should have known how to right a capsized life raft, for example.

I believe in avoidance. If bad weather's coming, don't go out. As I write I am in Porto Cervo, in the marina with 45 knots blowing for the last seven days! I had charter guests on board who understandably wanted to get out of port and at least anchor anywhere, just to get off the dock. I believe that to have 12 guests out at anchor with a forecast of Force 7-10 would be irresponsible when I have the availability of a nice safe marina berth. The charterers don't usually have some guy telling him no. If I can advise any captain anything, it is to not let yourself get pressured into dangerous situations because of commercial pressures. If you think you're going to trash the boat, damage the owner's property, risk crew, rescuers and everyone else who has to pick up the pieces of your mistake, just say no. Take your captaincy and responsibilities that come with it seriously.

I look like a total jerk in front of this charterer, he thinks I'm a wimp. I don't care. I know what it's like out there, and as far as I'm concerned I did him and my owner a favor by standing my ground. There was virtually zero risk of danger or damage for the whole wretched week!

I got pressured once into taking *Signe* from Southampton to Gibraltar with a terrible weather forecast. I wanted to wait 48 hours but the owner had a cocktail party to be at, so I was told to go. I was young and eager to please. We could have lost the boat; we got thoroughly thrashed for five days in the Bay of Biscay. The crew had never sailed together and were complete novices. That boat was built by violin makers, it was a work of art and it broke my shipwright's heart to see what was happening to her. We had waves breaking clean over the boat. The dodger carried away on the first day. We had a fire from small leaks, and water in the fuel because the vent pipes were too low. Inevitably, one thing led to another! I promised that trip to never put to sea again in bad weather.

What to Learn

Newcomers should always ask questions. But when they are told to do something a certain way, there is usually a reason, so don't question everything! I have had crew who can't or won't understand why you should use a bowline as opposed to, say, a round turn and a half hitch. Listen to the old guys. They aren't being

Help

pedantic, they are giving you something for free—experience!

Routine is important: do things the same every day, do the maneuver (e.g., sail handling) the same each time, stow the locker so it will be secure. Keep a good routine! Try to place yourself two steps ahead and spot potential problems. Prevention is better than cure—that applies infinitely at sea!

Sail as part of a crew for a season or two or three before you consider buying a boat. Learn to be a crewmember before you become the captain. An inexperienced captain risks the lives of his crew and his property, plus the people who come to his assistance. Take lessons.

Strange things happen at sea. We were sailing on *Mirabella* in the Caribbean from Guadeloupe to Martinique, with a regular crew of seven with 10 guests and a ten-month-old baby. We had the wind on the port quarter at about 2 knots apparent wind and were motoring, were doing 10-13 knots under headsail alone. It was lovely sail on a warm night. But later that night we had plenty of wind, some heavy rolls, and the headsail did a few huge “flogs” during the night shaking the whole boat.

We were in the lee of Martinique as the guests were waking up. We were now in 20 knots of beam wind in flat seas, making about 10 knots under the same small headsail and 3/4 engine revs. Through the night a small chafe spot appeared on the sheet (discovered during one of the hourly deck checks). If anything happened I though the sheet could part, but we needed the sail to curb the excessive rolling, so I elected to risk the breakage, as the furlers would have handled everything in the event of a problem. As we were now in calmer conditions I put this out of my mind.

I was having a morning coffee when there was a terrific BANG. I looked forward to the headsail and saw it flogging a bit. “The sheet broke,” I thought. I turned around and then through the wheelhouse windows I saw the masthead hit the water. Clearly we had done far more than broken the sheet... V1 shroud, portside had parted at the deck terminal and 175 feet (53.3 meters) of carbon fiber mast went over the side.

Guests were fitted with life jackets and sent ashore in a tender, an operation that took three hours—remember everyone just woke up. My crew and I then managed to get rid of this mess in seven hours. I’m pleased to report that we didn’t break a fingernail of the guests or crew.

There was carnage on the deck, rigging and carbon fiber shards flying about in the wind...teamwork and leadership saved the day. Common sense and good seamanship kept us safe. There is no drill one can practice for an event such as this. I’ve never broken a mast before or been on a boat where one has broken. My crew have basic skills taught to them and it’s up to me to ensure they maintain those skills so they can be applied to any situation we may encounter

Always be prepared for the unexpected. I would never expect to break -320 rod (320,000 pounds tensile strength) in 20 knots of wind motorsailing downwind with just a headsail, but it happened! BE PREPARED.

Help

British Steel II heading for Tasmania after a dismasting (due to a failed headstay turnbuckle) in the Roaring Forties south of New Zealand.

She was taking part in a backwards (upwind) around-the-world race.

Note the interesting "ketch" rig made up from a spinnaker pole (mizzen mast) and boom (main mast).

The 406 mHz EPIRB (photo below) is a wonderful tool for saving lives, but not one to be used lightly. Often the rescuers coming to the aid of a 406 signal take risk with their own lives—and sometimes pay the ultimate price. Before using an EPIRB make sure there are no alternatives.

Richard Bennett

EMERGENCIES

Even with the best preparation and maintenance something eventually goes wrong. If quick action is taken it is usually possible to mitigate the consequences. On the other hand, if the crew stands around in a daze, the problems are likely to multiply.

We all want to avoid real work experience in this area, so what can you do to prepare?

There is a certain amount of equipment to have aboard, which we'll discuss in this section as we go along. But most important is to play the "what if" game on a continual basis.

With the crew, rehearse mentally what the reactions would be if a shroud were lost on the rig, or steering was lost, or a torn seam was spotted in a loaded sail.

By playing these "war games" when the time comes to act, you and the crew will be a step ahead—and that might just save a whole cascade of consequential problems.

RIGGING FAILURE

Cruising mast failures are rare. When they do occur it is usually the result of rigging fatigue. And while losing a spar is something most of us would rather not think about, advance planning, coupled with a modest inventory of spares, can usually save the mast before it goes over the side.

Checking the Rig

Fortunately, it is normally possible to diagnose potential problems before they become terminal. One must be prepared to relieve the over-strained fittings and repair the jury rig quickly. Under pressure at sea is not the time to be thinking about how or with what repairs will be effected. That should be done before you leave port.

As a result of many years of racing with skinny rigs (and occasionally losing same), we are in the habit of checking our cruising rig carefully. At sea, we survey the lower swages, toggles, and turnbuckles everyday. Except for peace of mind, until now my inspections have never yielded results.

Today we are sailing the Indian Ocean, 300 miles from Durban, South Africa, smack in the middle of the ship-killing Agulhas Current. *Intermezzo* has just weathered her third southwesterly gale. Our morning rounds turn up broken strands of wire at the swage of the port after lower shroud on the mainmast.

Before leaving on our trip we had modified the lower and intermediate shrouds so they were the same length and then put a spare wire aboard, just in case.

Going aloft to remove the offending wire, we are stymied by a frozen clevis pin. Try as we might, it is impossible to free. From our lofty perch we can see the approach of a heavy line of clouds. Another black southwester is on its way. We consider leaving the shroud as it is, but not knowing the intensity of the coming storm or how much good wire is mixed in with the bad, we feel it has to be changed. We have no choice but to hacksaw through the 5/8-inch (16-millimeter) stainless steel pin. While it would be an easy chore with a vise, we are exhausted working aloft after the fourth hacksaw blade finally makes its way through. After a last tired heave, the new shroud is in place. Minutes before the storm hits the turnbuckle is tuned and the rig once again secure.

For 36 hours the wind howls at above 50 knots. One nearby yacht is rolled over and another knocked down severely, twice. If we had not made the morning rounds, if we had not stowed the spare shroud, if we had not had a good inventory of hacksaw blades...?

While this event ended well, it should have never taken a hacksaw blade to remove the clevis pin in the first place. The lesson—make sure all pins and turnbuckles are well lubricated and free turning. This way if a repair, or the need to get rid of the rig occurs, the pins can be easily pulled.

Often having a small supply of emergency rig repair materials can turn a potentially serious situation into a good story.

Here are some things to consider carrying:

- ❑ Proper cutting tools for heaviest wire (manual or hydraulic wire cutters).
- ❑ A large inventory of high quality hacksaw blades suitable for stainless steel (32 teeth/inch).
- ❑ Spare wire which can be made to work for all rigging elements (for short term this can often be a size down from the heaviest).
- ❑ Sta-Lok or Norseman-type terminals.
- ❑ Large, high-strength shackles (high yield steel rather than stainless may be required).
- ❑ Inventory of Spectra line for lashing.
- ❑ Spare turnbuckle.
- ❑ Spare toggles.
- ❑ Banding tool and stainless steel banding material.

Fast Reaction Can Save Your Spar

Occasionally you will be sailing with an uncomfortable feeling about your rig. Maybe it is the backstay or headstay that has you concerned. Often taking an extra halyard forward or aft, to a strong point on the deck, will provide a secondary means of mast support if primary standing rigging (or its hardware) fails.

If a piece of standing rigging breaks, it doesn't have to mean the loss of a spar. Here, speed and the proper reaction is all-important. In order to be prepared for the worst we try to review each possibility and how we should react.

If the headstay breaks and you are headed downwind, keep the boat on a steady off-the-wind course, at as deep an angle as you can safely steer. The pressure on the mainsail and headsail will keep the mast forward until you can get some spare halyards set up to hold the rig.

If the boat is heading on a close reach, or to weather, immediately easing the main sheet, and then the runners (if the rig is not runner-dependent), gets the load off. With hanks and a high modulus rope or wire luff, the headsail may keep the mast from heading too far aft. Get the boat turned downwind as soon as possible and then get spare halyards rigged forward.

If you are running and the standing backstay goes, the first thing to do is get the boat into the wind. At the same time throw off the jib sheet and tension the main. The closer to amidships the boom, and the tighter the sheet, the better job it will do of supporting the rig. But the quickest thing to do is head into the wind, fast.

When a piece of the side rigging fails tack or jibe to unload the rig. This puts the broken rigging on the leeward, unloaded side. Often just tacking without releasing the headsail sheet, so you end up hove to, is the fastest way to get the rig unloaded.

Carry Spares

It helps to pre-measure spare wire, especially if one piece is meant for several potential jobs. Masking tape, carefully applied, can indicate where to cut for shorter shroud requirements.

To be fully prepared for rigging failure, we always carried aboard our *Intermezzo*s a small inventory of spares. Several shackles of the largest possible size with a pin that fit through our terminal eyes were very handy. They could be used as toggles, or with many strands of light line, in lieu of a turnbuckle. Quarter-inch Dacron rove through a shackle 20 times will carry the working load of 5/16-inch (8-millimeter) wire for a short period. Toggles, turnbuckles, clevis pins, and a spare mast tang or two were also in the spares kit.

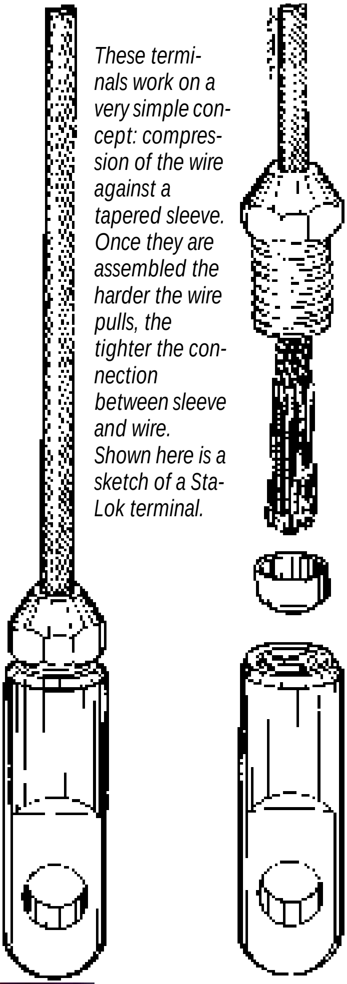
Nowadays we carry several hundred feet (60 meters) of 1/4-inch (6.3-millimeter) Spectra line. This has a 5,000-pound (2,200-kilogram) breaking strength, and is great for reeving between shackles.

Emergency Rigging

We usually carry one piece of the largest wire, long enough to be used as a backstay or headstay, it can also as a cap shroud. It has a proper terminal affixed to one end. By using a Norseman or StaLok terminal at the deck, it is ready to reeve in a minimum amount of time, cut to the proper length, and by preparing the appropriate bottom end.

Before we started voyaging we practiced the actual installation of removable terminals ashore with an experienced rigger. We have found that up through 3/8-inch (9-millimeter) wire they can be assembled with wrenches. Beyond this size a vise is needed.

There are a number of choices in terminals which can be applied at sea. We've sailed with Norseman and Sta-Lok, and with New Zealand versions of the same. All seem to work quite well although none is particularly easy to use on a heaving deck. They all come with very difficult-to-interpret instructions, although the actual installation of these terminals is not that hard, once you've had some experience. On the following pages we'll take you through the assembly of a Norseman eye. We are indebted to Phil Garland of Hall Rigging in Bristol, Rhode Island for the demonstration.



These terminals work on a very simple concept: compression of the wire against a tapered sleeve. Once they are assembled the harder the wire pulls, the tighter the connection between sleeve and wire. Shown here is a sketch of a Sta-Lok terminal.

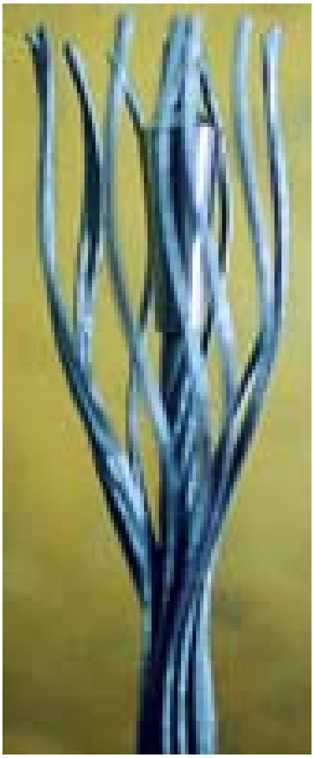
Step one is to file the edges of the wire so there are no sharp burrs. This allows them to slide into position more easily inside the body of the terminal.

After sliding the female portion of the terminal down the wire the next step is to unlay the wire so that the outer strands are splayed out from the core. A vise grip works well for this process.

A screwdriver is used to open and direct the wires into an even pattern. This will take awhile, and with some wire is difficult due to construction. Take your time and get it right.

The cone is now slid over the wire core and then held a specified distance from the end of the wire. This distance is relatively critical. If the cone is too far down, the ends of the outer wire will not fit properly into the fitting. If there is too little wire exposed there will not be sufficient bite between the cone and end cap.

For Norseman fittings Phil Garland suggests that one-and-a-half times the wire diameter protrude from the end of the cone. For a piece of 1/2-inch (12.7-millimeter) wire this would mean a 3/4-inch (19-millimeter) protrusion. StaLok recommends a 2-millimeter (3/32-inch) protrusion (they use a different design cone and head).

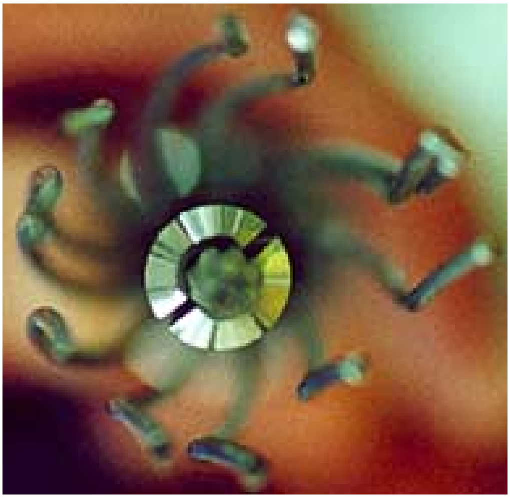


Bring the body of the terminal fitting towards the end of the wire and check how the outer wires splay around the cone. You will have to work the wires a bit with the edge of the screwdriver to get them evenly splayed.

Help

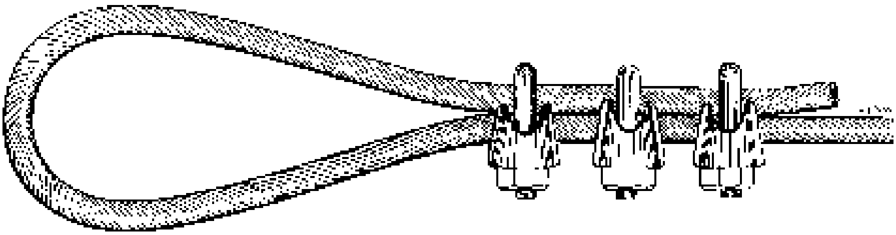
The piece of wire being used for this demonstration was difficult to handle due to the way it was manufactured, and the splay in this photo is far from ideal. Still, it is good enough—barely—to get the job done.

Now it is time to do a dry run on assembly. Lubricate the threads of the fitting with something like Tuf-Gel or Lanocoat, and smoothly screw on the end fitting initially by hand. Tighten the fitting a gentle two or three turns to make sure the wire is evenly distributed. Then finish tightening. With 5/16-inch (8-millimeter) wire use a pair of 10-inch wrenches. For 3/8-inch (9.5-millimeter) and 7/16-inch (11-millimeter) wire use 12-inch wrenches, and for 1/2-inch (12.7-millimeter) you will need 14- to 15-inch wrenches.



Overtightening does not improve performance and may actually damage threads or the wire. There will be minimal resistance at first as you begin to tighten. This will gradually increase to a moderate level. Once you have reached this point resist the urge to give a final, really hard crank with a wrench. Since this is very much a feel issue the best approach is to assemble several terminals in the presence of an experienced rigger. You will then know what is the right amount of tension.

When you are finished tightening the fitting take it apart again. The ends of the wires will be bent as shown in the lower left photo (above). Clean the lubricant off the threads. The final assembly involves the use of a sealant and thread lock compound. Sealant should be marine grade and not have a mildew inhibitor (that's what gives silicone the vinegar smell). Fill the terminal end fitting hollow with sealant, so that it forms a small mound, and then use red Loctite on the cleaned threads. Reassemble as before and you are ready to use the wire.



There's a right and wrong way to use cable clamps. The body should always be on the load side and the U bolt on the end of the loop as shown beside.

If you are using a hacksaw to cut wire, tightly tape the cut area to keep the wire from unraveling.

Cable clamps can also be used in some cases. Rigid 1x19 wire cannot be bent around thimbles, so if a joint is required, the cable clamps hold the two pieces of wire in tension together. It is an approach to be used in the last resort, as only a small percentage of the wire's strength will be retained by the connection.

Hydraulic cutters like those shown above will cut the heaviest wire (but not rod). Simply clamp the jaw around the wire, and then pump until the wire is cut. While this takes effort, it is far less than is required with manual cutters (as shown on the next page).

Wire Cutters

Cutting standing rigging requires specialized tools. Up through 7/16-inch (11-millimeter) wire, cable cutters can be used. We carried Felco C-16 cutters, and with the right technique they will make it through. What is required is an abrupt downward thrust on the cutters. Technique, rather than brute force, carries the day. Once you have practiced, it will become easy. But don't expect to make it through on a heaving deck if you haven't done your homework.

If your rigging runs over 3/8-inch (9-millimeter), you should consider hydraulic cutters. A compact unit by Huskie Tools, available at most rigging shops, will make quick work of wire up to 3/4-inch (19-millimeter). For rod rigging lots of 32-tooth high-carbon steel hacksaw blades, used with deliberate action, will be necessary.

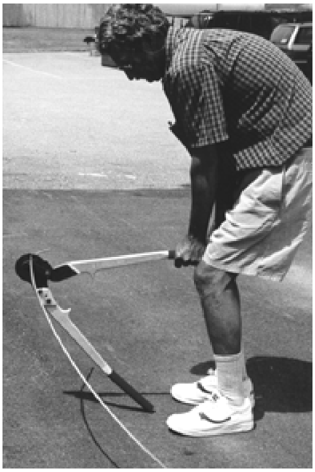
When we sail with removable terminals (Norseman or Sta-Lok), we carry spare cones for each size. I have learned the hard way to be sure, before I leave port, that turnbuckles and clevis pins are free-moving.

Dismasting

While highly unlikely, you need to consider the elements of a dismasting, and how to deal with them in advance.

The most important element is preventing hull damage from spars which may be over the side, while protecting the crew from injury.

Help



Using wire cutters requires a technique rather than brute strength. Phil Garland demonstrates the "bounce." The jaws of the cutter are tightened on the wire, and then rather than applying steady pressure he uses his weight to bounce the handles. Note the compound lever action of this model C112 Felco cutter. This design gives you more leverage, and is far superior to the single-action heads. Note that none of these wire cutters are going to be easy to use at sea—which is why practice is important.

Some injury risks may have to be taken in dealing with the rig in order to insure vessel safety. Being prepared will reduce these.

To repeat what we said earlier, make sure all your clevis pins are free-turning and well lubricated so you can get rid of them in a hurry if required.

A corollary of this is making sure that split pins (cotter keys) are properly spread and not excessively long (see photos page 22).

Being familiar with the proper use of wire cutters is another part of this equitation. If you are ever called to use it the odds are it will be on some stormy night, not the time to be reading manuals!

If getting rid of the rig is undesirable, impossible, or simply too dangerous, some attempt needs to be made to secure the spars alongside to prevent them from damaging the hull. If you have enough of a spar standing, it may be possible to use this to rig a tackle with which to get the overboard sections back on board.

It is generally better to cut the rig away and protect the hull from damage by the spar.

There is going to be a strong urge to get the engine into gear to give you control and get you back on your way. *Do not start the prop until you have checked and rechecked that no sheets or rigging are dragging where they could foul.* Otherwise, Murphy's law states you will have a fouled prop!

If the rig does go over the side in rough weather:

- ❑ Get the heading of the boat stabilized as soon as possible, (by using a drogue or the engine.
- ❑ If the engine is used, be sure there are no lines to catch in the prop (which will necessitate some cleaning up).
- ❑ Have all crews wear harnesses.
- ❑ Use safety lines on all tools to keep them from going overboard.

The Jury Rig

If the rig does go over the side, there is still usually lots of stuff on board with which to make a jury rig (see the comments of Skip Allen on page **186**).

If the spar is stepped on the keel, the odds are there will be at least a stump of the spar as high as the old gooseneck, which makes a good starting point.

Survey what is available in the way of spars. Booms, spinnaker poles, even reaching struts can be used to make a mast. If there are two spinnaker booms these can often be tied together at the head, and then lashed to the shrouds. This bipod is then pushed into position (or lifted a little way off the deck and then winched vertical. This is a very stable rig (with head and back stays of course) and relatively easy to install.

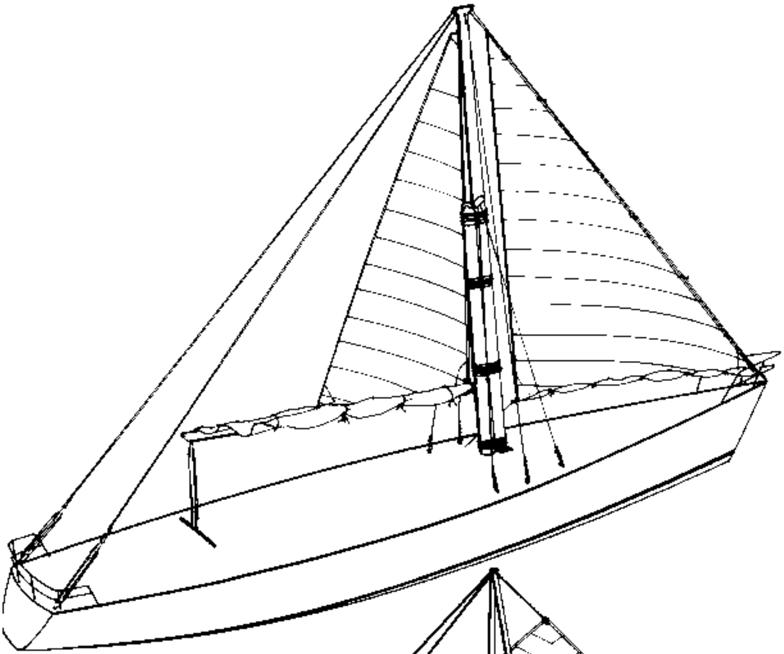
The photos below show the stump of a mast being used as a jury rig. The mainsail has been "reefed" down to trysail size, to fit the spar.

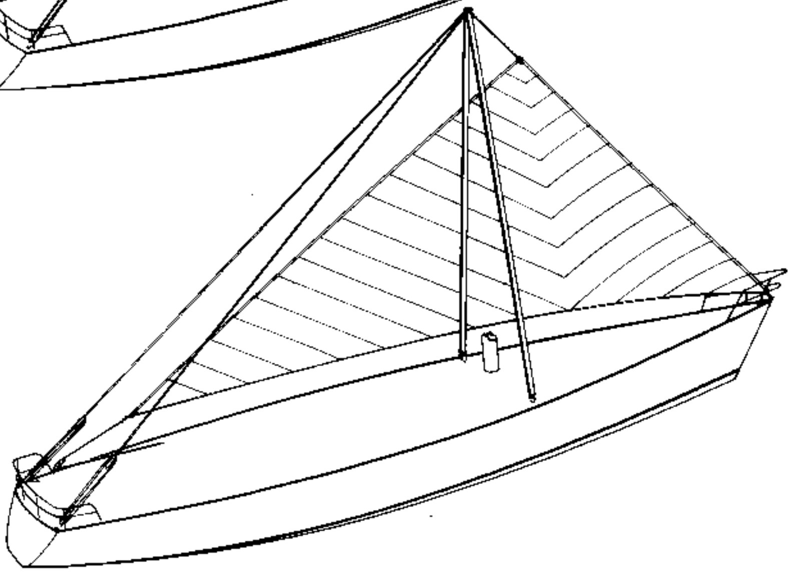
Note the storm jib being flown inverted.

Richard Bennett

Blow-ups (hence the grain) at the head and tack of the inverted storm jib. The normal tack is used for the halyard attachment point. The old head is tied off at the tack effectively shortening the new luff of the storm jib.

Help

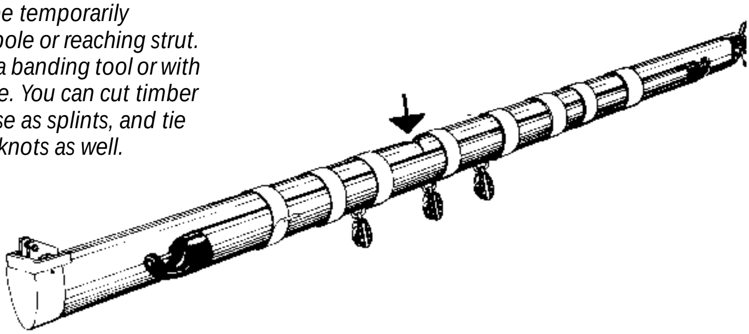




Using a mast stump (upper drawing) is the best way to start a jury rig. A broken piece of spar, spinnaker boom, or even the main boom can then be tied or banded to the stump. Sails are then reefed by tieing the corners as required.

If there are two spinnaker booms aboard, they can be used as a bipod (middle drawing). Often using a high aspect jib with the luff towards the deck, as shown, is a simple way to generate some sail area.

A broken boom can often be temporarily repaired using a spinnaker pole or reaching strut. The "splint" is applied with a banding tool or with multiple seizings of light line. You can cut timber or plywood into strips for use as splints, and tie them on with "constrictor" knots as well.



Help


Fevrier\Stock Newport

Not all rigs go over the side in storms. In fact, most failures occur in moderate conditions, as is the case above. In this case, Il Moro has lost her rig during an America's Cup elimination series. This photo still holds valuable lessons. Look at the mess, for instance, at the break. You have a twisted mast section and torn sails to deal with as well as the standing and running rigging. If this occurred on your boat, how would you deal with it?

Safety Precautions

If the rig goes over the side in breaking seas the boat will come to rest more or less abeam of the seas, in a lying ahull position. Motion with the seas on the beam will be violent, and shorn of the stabilizing weight of the rig, the boat will be more liable to a knockdown or rollover.

In order to insure the safety of crew and vessel in these conditions, the number-one priority should be to get the boat turned end-on to the waves, preferably bow-to, but if not, then stern-to.

The odds are you will not want to use the engine for this right away as the risk of fouling the prop will be great. Some form of drogue off the bow or stern is ideal in this situation.

If you do not have a drogue, often the rig itself will pull the bow into the seas, if left hanging by the headstay (i.e., release all shrouds except the headstay).

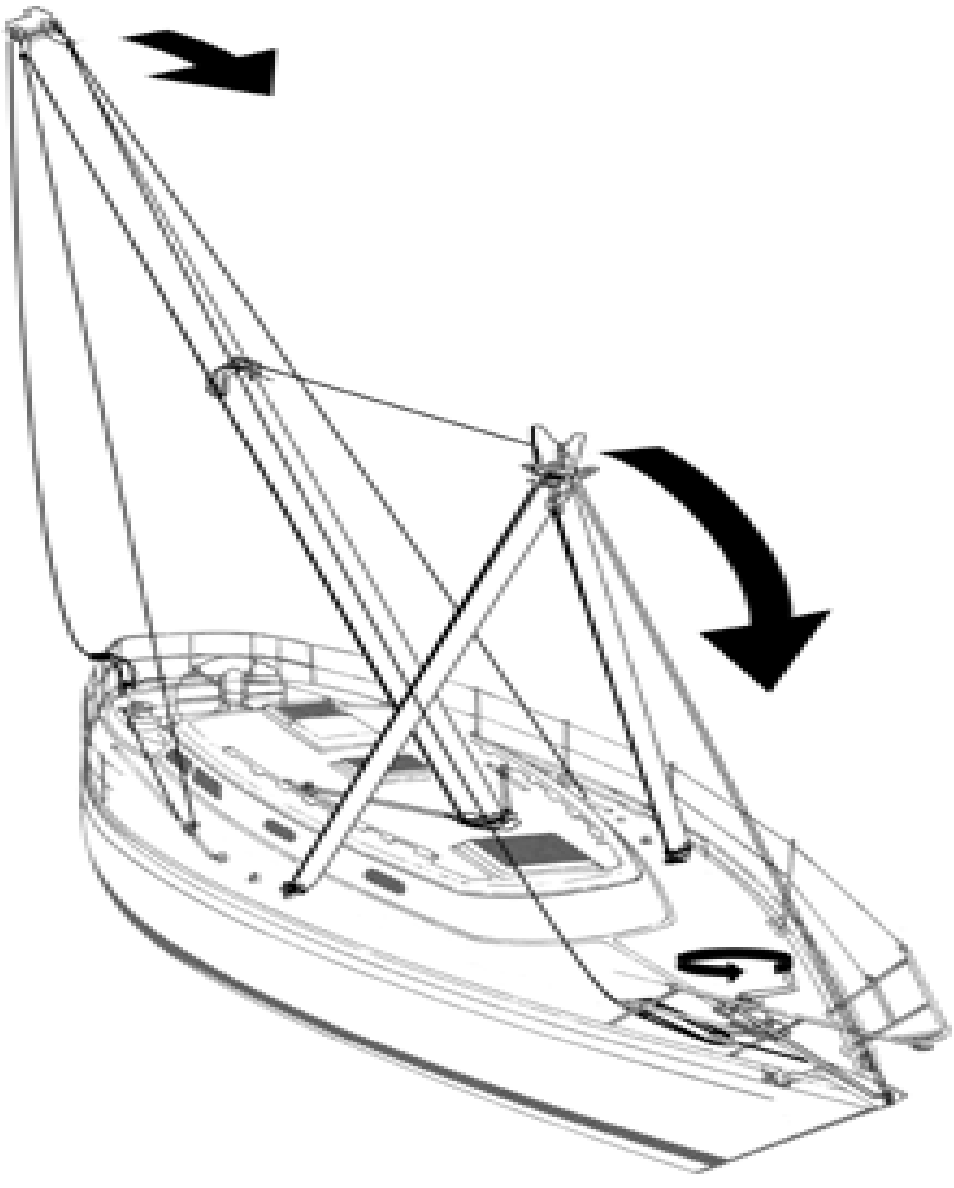
The risks on deck to the crew multiply when the rig is down due to loss of stability in the seas and the beam on attitude. While the crew must work swiftly to get the rig free and the boat turned into the wave, they need to stay with the boat in a knockdown—so consistent use of safety harnesses are a must. Also, any tools being used should be secured to the user or the boat by a safety line.

Richard Bennett

The Southern Ocean seems to eat its share of rigs. In this case, the yacht West was rolled 360-degrees and lost both spars. That flag a little aft of amidships is actually flying off the mizzen stump.

The mainmast was buckled in the lower panels so the crew cut the bottom part of the main mast free and then used the upper two-thirds as a new spar.

Fore and aft lowers were rigged from the turnbuckles, using rope, to the intermediate shroud tangs just below where the upper spreaders used to attach. The old masthead was then rigged with head and back stays and with cap shrouds.



There's a tried-and-true method of raising spars (which has been in use for many centuries) called sheer legs. A bipod is created using two poles. These could be spinnaker poles, or a boom and spinnaker pole. The two sections are seized tightly together, and then spread at the base. The bases are then tied off (as in the bipod rig shown on page ***557****). The set of sheer legs are then used as a derrick to hoist the replacement spar.*

In the replacement process, the base of the new spar must be securely tied at the base to keep it from kicking forward. Side shrouds are also rigged to keep the mast from wobbling side to side as it is raised.

Once the spar is set, the sheer legs are removed. They are then available for use as a main boom or mizzen mast.

Running Aground

Running aground is a common experience to anyone who sails. Whether in San Francisco Harbor, the Chesapeake Bay, or some beautiful English river, you'll find the bottom if you go out often enough. In most cases, given a few simple precautions, and assuming protected waters, little or no damage will result (except to the skipper's pride if his *faux pas* is observed).

The small freighter, above, blown ashore during a tropical hurricane on the island of Dominica in the West Indies, would have been much better off putting to sea.

Salvage would not be difficult, except it is costly and in this case, the owners simply gave up on the ship. It does sort of ruin the view of the folks ashore, though!

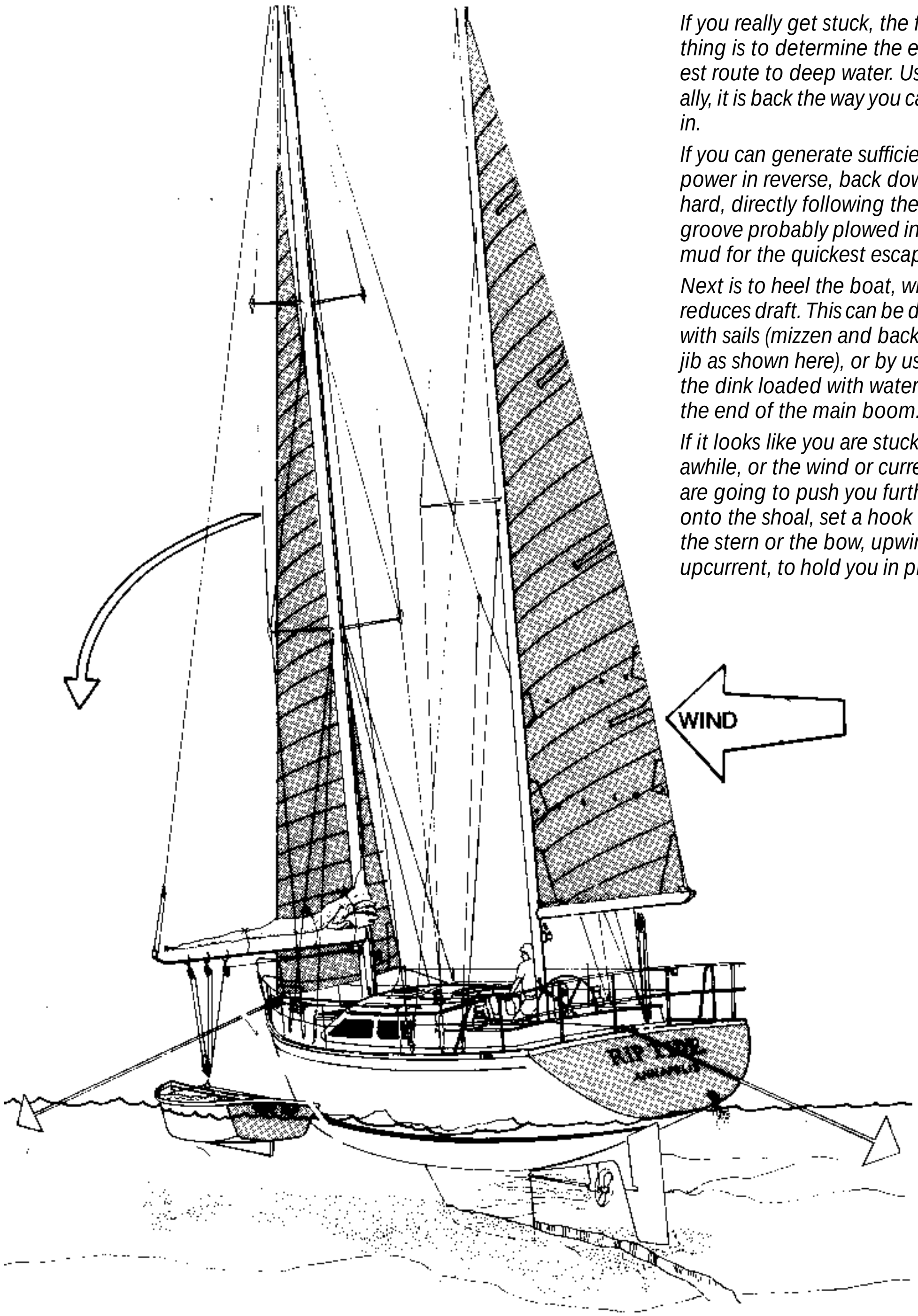
Tidal State

When you're sailing where the risks of running aground are high, it's a good idea to write into the log the state of tide during the next 24 hours. If caught on a slack tide or the beginning of ebb, you must work with all speed to avoid being stuck for the next tidal cycle. When the tide's rising, you can usually set an anchor and let the moon do the work for you. If your day's run will take you across a shallow spot, be sure to get there before high water. If you run aground, there's still more water coming in to float you free.

Also remember to consider the monthly tidal cycle. If you get caught at high water springs, you may sit a month or more waiting for the next extreme high tide to float free. The local yachtsmen at the Matavia Bay Yacht Club in northern New Zealand were upset one year when a visiting yacht went aground on the "grid" (telephone poles driven into the mud to support the hull when the tide runs out) at high water springs, and couldn't get off for an entire month!

Current, wind, the possibility of a change in the weather—all have to be considered. The design of the vessel will also have much to do with attempts to float or pull her off. Older designs with low freeboard and heavier displacement have to be carefully sealed to avoid flooding on an incoming tide if lying on their sides. More modern boats, with lower displacement/length ratios, have enough buoyancy in their topsides to float them quickly with a rising tide.

Often the easiest way to get free is by winching yourself off with a kedge anchor. If the tide is dropping, this must be done quickly, before the boat is really stuck. Having the dink ready to launch quickly, and a kedge pre-rigged with rode, makes the chances of a successful kedging operation much higher.



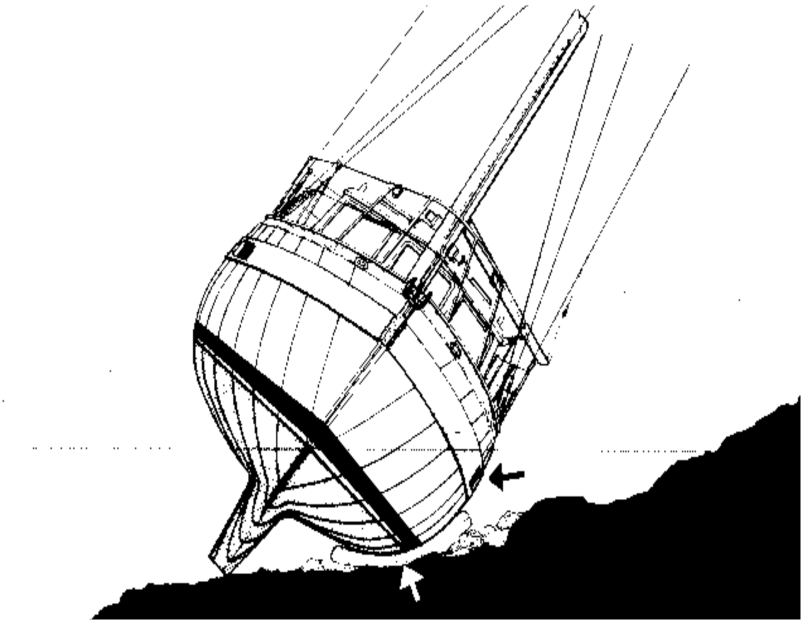
If you really get stuck, the first thing is to determine the easiest route to deep water. Usually, it is back the way you came in.

If you can generate sufficient power in reverse, back down hard, directly following the groove probably plowed in the mud for the quickest escape.

Next is to heel the boat, which reduces draft. This can be done with sails (mizzen and backed jib as shown here), or by using the dink loaded with water on the end of the main boom.

If it looks like you are stuck for awhile, or the wind or current are going to push you further onto the shoal, set a hook off the stern or the bow, upwind/ upcurrent, to hold you in place.

Help



If the boat begins to heel over on a rocky bottom, often using a cockpit cushion or bunk mattress can spread the load and reduce cosmetic damage to the hull.

When the Water Level Drops

If stuck for the duration of the tidal cycle, and you expect the water to go out far enough to lay the vessel down, take a pole or oar and sound around the vessel for underwater rocks or obstructions. If there are rocks about, cockpit cushions and fenders can be used to protect the hull.

Boats with wide keels will tend to stand erect, but the risk is that something will cause them to topple. Our feeling is that unless there is some means of support available, it's better to induce the boat to lay over on one side or the other as the tide falls.

Breaking Free

There are several standard steps to take in all simple grounding situations. The first is to set an anchor uptide (that is, in the direction the water will be returning from) and/or upwind. Then, if a powerboat is about, you might ask the skipper to make a few high-speed circles around you. The attendant wake may be enough to bump you free. If you have a good-size prop with powerful reverse thrust, you may be able to excavate the sand/ or mud from beneath the keel with prop wash. Swinging the rudder back and forth can help when using the engine in this manner. Keep an eye on engine temperature, and give a periodic look to the saltwater strainer; odds are it will be picking up mud and debris in the intake. If the shaft seal and rubber impeller on the saltwater pump are a concern, it may be better to wait for the tide to float you off.

Kedging will often provide that extra *oomph* required to break you free. Hauling your vessel down by the masthead and its rode with a kedge hook attached to a halyard will lessen her draft and can be effective with smaller boats.

Running aground in protected waters:

- ❑ Try to back off first.
- ❑ If this doesn't work, get an anchor set upwind or uptide, to maintain position.
- ❑ Heel the boat using crew weight or a dinghy full of water on the end of the boom.
- ❑ Get a power boat to run around making a wake to bounce the boat free.
- ❑ Take an anchor to the mast head to heel the boat over.
- ❑ Sit back, relax and enjoy a good book while you wait for the tide to float you free.

van der Wal/Stock Newport

On smaller boats (above) it is often possible to free the keel by getting a couple of crewmembers out onto the boom—an easier operation usually than rigging the dink and filling it with water.

Another approach, along with heaving the masthead down with an anchor, is to push the boat around with a dinghy (or series of dinghies). The operation below is taking place in the Bahamas, an area with lots of thin water!

Zydler/Stock Newport

Help

Greiser/Stock Newport

We started out talking about how important it was to quickly deploy a kedge anchor if the wind, tide, or waves are pushing you towards shore. If that's the case, as the tide comes in the boat will simply bump its way higher and higher onto the land, as opposed to floating free.

The other issue is making sure that the keel does not become trapped in the mud of rocks, preventing the boat from rising with the incoming tide. If this occurs, or the cockpit lockers begin to flood, what was a minor grounding can quickly develop into a major disaster as shown below.

McGowan/Stock Newport

Help

This boat lost its way in the fog, and missed the entrance to the Marina del Rey breakwater in Southern California. Conditions were moderate, and after several days of organizing she was pulled off at high tide. Note the four men hanging onto a halyard from the masthead to heel the boat over a bit more and help her keel break free.

Exposed Strandings

In many cases with modern, well-constructed yachts, a severe stranding need not mean the end of your dreams. Many amateurs have successfully rescued themselves and their yachts from the clutches of terra firma in situations that would seem to many to be hopeless.

The actions you take in the first few minutes of a stranding could make the difference between success and failure. The design and construction of your vessel will control, to some extent, the actions you take. Draft, keel type and reinforcement, hull material, freeboard, displacement—all play a part in how you maneuver and safeguard your boat.

Hull Material

Metal boats have the longest life span in a dangerous grounding. A moderately well-built aluminum or steel yacht can spend months or even years on a reef without sustaining major damage to the basic structure. Fiberglass is not as resilient, but a strong fiberglass hull can survive in salvageable condition a considerably longer period than one built of wood; ferrocement has little, if any, tolerance for withstanding impact.

The coefficient of friction of the hull material also figures in how you approach a salvage operation. Metal and fiberglass hulls slide easily over coral, small rocks, or rough sand. Ferrocement has some tolerance in this regard, while wood will abraid and develop a high degree of friction.

Keel Shape

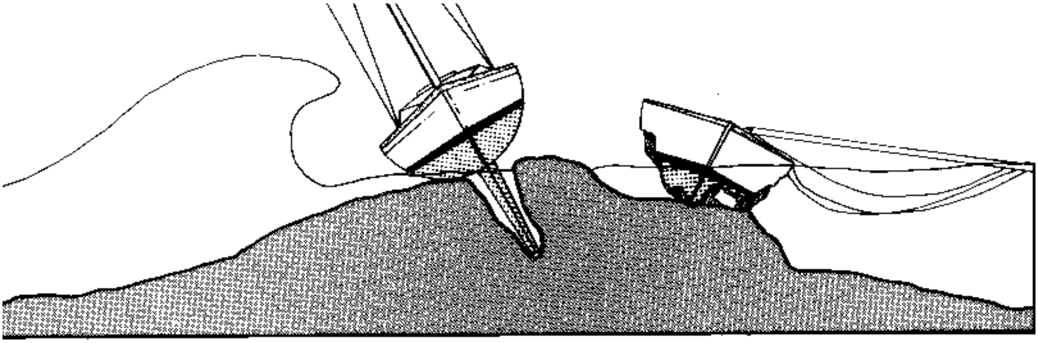
Keel shape is a critical factor in any grounding. Yachts with deep keels are more likely to become trapped in rock or in coral pockets. A beach, on the other hand, plays no favorites. Some deep-keel yachts have an advantage if their keel or ballast structures are removable. In a severe situation the removal of this weight will make refloating substantially easier.

If your boat has a deep fin keel and you think you might employ this approach should the boat become entrapped, have a good look at your keelbolts and be sure to carry onboard the right socket wrenches, extensions, and breaker bars to free them. And make sure they are not frozen.

The tow boat is pulling steadily, but the boat doesn't move until a small wave lifts the hull somewhat, and the keel breaks free (above).

Below, the happy moment for owner and crew when they are floating free again.

Help



The deeper the keel, the higher the risk of being trapped in a rock or coral pocket (and the less time there is to free the boat).

In this drawing the keel has worked its way into a pocket (in coral on occasion the keel will actually grind a deeper pocket).

The boat is trapped and any seas which come along will pound it unmercifully. Even a steel boat will have a tough time surviving in breaking surf.

Super Structure

The size and shape of the boat's deckhouse plays a part as well. If you have a lot of superstructure, the boat is more likely to be damaged by breaking seas.

Displacement

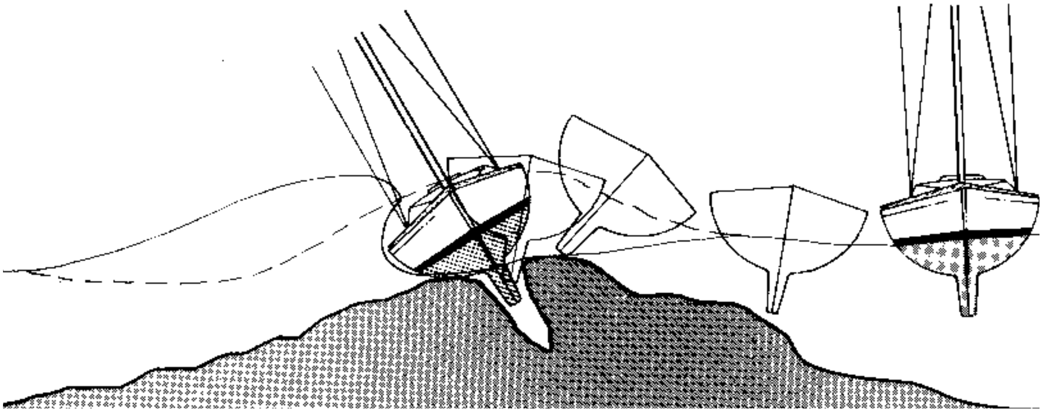
Displacement is one of the most important design factors to consider in attempting a salvage operation. Light-displacement vessels tend to be tossed out of the surf line, up and onto shore, out of harm's way. Heavy yachts will get stuck in or near the surf line, where they are subject to more punishment. In the Cabo San Lucas disaster, which we discussed on page 367. Seventeen yachts were driven ashore by breaking seas, one 40-foot (12-meter) ultralight racing boat, whose scantlings were considered foolhardy by many, was thrown high up the beach and suffered less damage than any other vessel that found itself ashore. In the salvage operations, her keel was removed, after which she was towed back to San Diego.

The Decision-Making Process

Pre-planning is one thing, but what steps do you take once danger is imminent or suddenly a reality? There are two sets of decisions you have to make. The first concerns personal safety. You will want to don life jackets, protective shoes, and clothing to shield you from cuts and abrasions—wet suits work well. You must of course, decide the best means of safeguarding the lives of yourself and your crew. Is it best to stay with the vessel, ride her into shore, take a small boat ashore, or as a last resort, swim for it? The major criteria will be your relationship to the surf.

Next, you must quickly decide a basic question of vessel survival. Is there a possibility you can get a hook set, hold the boat's head up into the surf, and kedge or power back into deep water? If it is not an immediate likelihood, what are the short-term prospects for holding your position and not sustaining damage? Or do you want to be driven ashore as quickly as possible, to get out of the surf line?

If you have hit an obstruction that is surrounded by deep water you also want to consider the consequences of freeing yourself if the underbody has been damaged severely. It may be that backing off into deep water will allow the boat to sink before the leaks can be stopped.



Shallower draft boats have less of a tendency to become trapped in a pocket. And if they are caught, it is possible for a wave to lift them up and out of the pocket (as shown above).

Obviously what you do depends on what it is you've hit and the type of shoreline, if any, behind it. A gently shelving beach presents less trouble than a rocky coastline.

Tidal Factors

Tidal factors play a big role in deciding a course of action. If you hit at low water and the tidal range is several feet, you stand a good chance of floating off quickly. In this case it may be wise to run out a kedge through the surf as soon as possible and then wait out the rising water.

Maintaining Watertight Integrity

After you assess your boat's chances of surviving, your next concern is her watertight integrity. As quickly as possible seal all dorades, engine room vents, and hatches. Remember the cockpit lockers, forward anchor hawse holes, and companionway slides. Keeping water and debris out of the boat is of paramount importance.

Weather Impact

While most groundings, oddly enough, seem to occur during mild conditions, stop for a moment to evaluate the weather. What are the prospects for a swell moving in, or for a fast meteorological change?

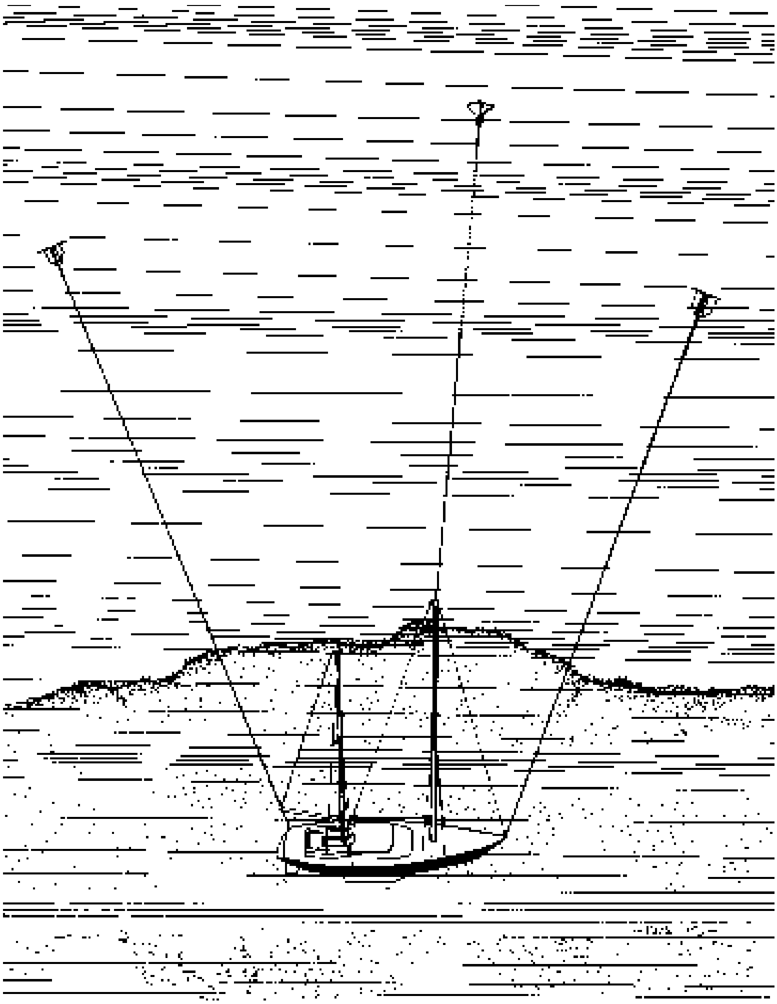
If there is any single most important ingredient to success in rescuing a stranded boat it is speed. Once you recover from the initial psychological shock of that first series of impacts of hull and ground, formulate a plan and get right to work. Even if your vessel looks okay in its present predicament, don't waste time. A change in local conditions could put you at risk, or perhaps you can't see a rock grinding away under the hull.

Lightening the Boat

Unless you have been fortunate enough to strike at the low end of a very high tidal range, you will probably find it necessary to remove as much weight from your boat as possible. Start by emptying watertanks and then go for the canned goods, extra chain and anchors, and books. Removing sails, running rigging, locker doors and drawers, even floorboards, can help reduce weight.

If you have emptied all the removables and find still more weight needs to come off, take a good long look at your keel. It is frequently easier than it appears to remove a ballast shoe or fin. If you have addressed this problem in advance, so much the better.

Help



If you are stuck in the surf, and need to heel the boat over to help free her, the approach shown on page ***564*** *(using a dinghy, etc.) are not likely to work.*

With the seas trying to push you onto the shore the best approach is often going to be a series of anchors, one from each end of the boat to hold her in position, and a third from the mast-head.

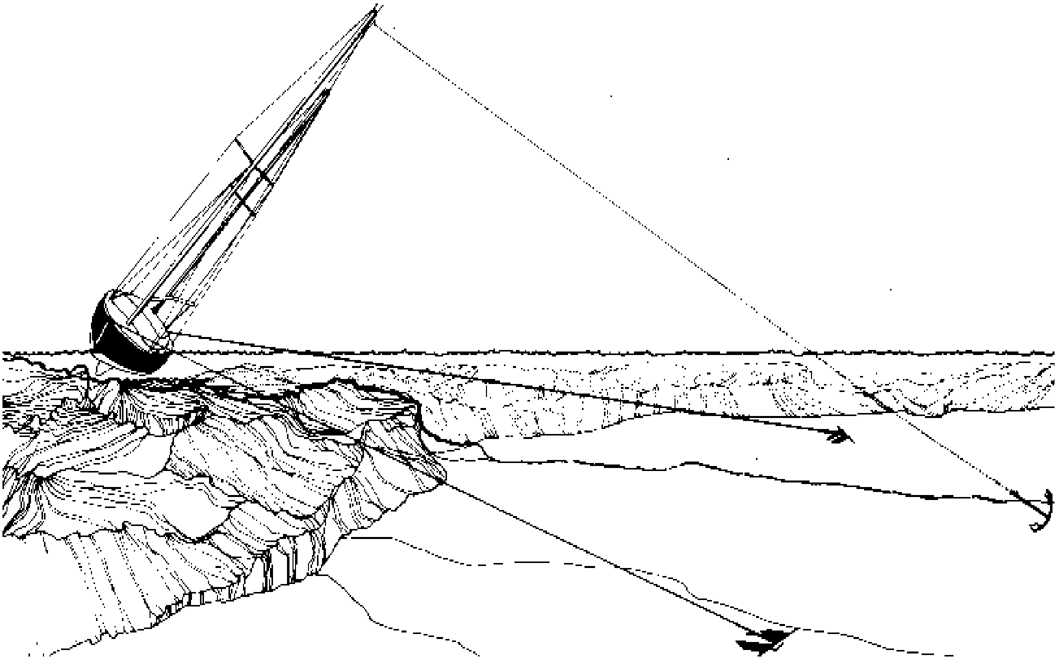
The masthead is first pulled down, and then the bow and stern anchors are used to kedge off.

Increasing Heel

As we've already discussed, in some situations you may be able to float your boat on her side towards deep water. Being trapped on the seaward side of a lagoon or estuary will sometimes yield an easier escape across the shallows fronting the inland body of water. Heaving your boat down by the masthead will reduce her effective draft. A 40-foot (12-meter) sailboat that draws six feet (1.8 meters) on her feet may only draw 2 1/2 feet (76-centimeter) at a 70-degree angle of heel. The mast head can be pulled down by attaching halyards to rocks ashore or by fanning out a series of anchors bridled together as a counterweight. As the mast comes closer to the water, less weight is required to hold the vessel. Winching from the masthead is also sometimes a means of both hauling down and moving a boat.

You can accomplish kedging towards deep water by winching from one end only or from both bow and stern, pulling yourself along sideways.

Help



Salvage Equipment

The gear you carry will also greatly affect your options in attempting a salvage. If you are serious about having a good chance to rescue your own vessel, you will want to have aboard a modest inventory of specialized equipment. The first thing to look for is a method of working your way back to deep water. On your own, you will have to kedge off (unless you're lucky enough to ground on a rising tide). The friction loads between the hull and seabed will be substantial, and your gear will have to be powerful enough to overcome this resistance. We favor having the biggest anchor windlass possible for just this reason.

You should also have the means to assist the windlass manually; some types can be backed up with a hand crank to increase capacity when the electric or hydraulic motor starts to stall.

Many experienced cruisers carry extra-large snatch blocks as well. These can be attached to the end of a chain lead and create a two-to-one purchase between windlass and anchor.

You will also want to have aboard some means of coping with damage to the underbody. There is a chance that the boat's watertight integrity will be breached, and you have to be ready to deal with the water quickly. A collision patch, underwater epoxy, dunnage for bracing, and rags should be available.

If a leak does occur, one of your most important concerns will be pumping the water back out. Once again the damage-control pumps we discussed earlier look awfully good.

The same three anchors, but with a different view.

Knowing the easiest path to deep water by reconnoitering with a lead line, portable depthfinder, or visually checking is important. Often moving just a small amount in one direction or the other will avoid major obstructions.

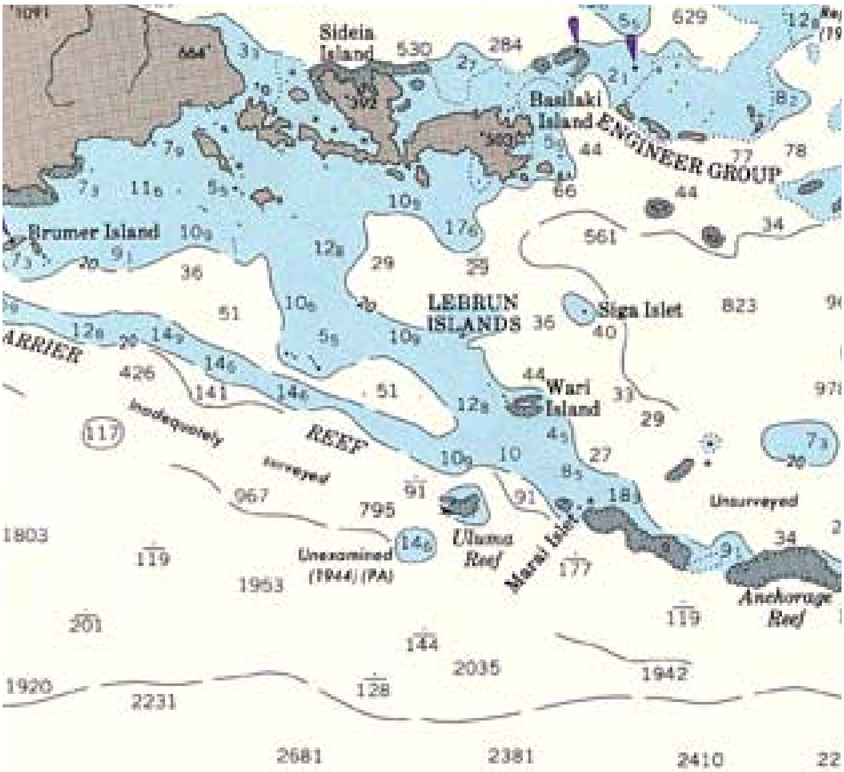
Special Equipment for Coral

If you plan to cruise where there are coral reefs, you will also want to have aboard the means of breaking a path through the coral to clear water. A pickaxe is ideal; large angle iron stakes will also work. Coral is fairly easy to break away, and having the means to do so might make it possible to get your boat back to deep water or farther inshore, away from the dangerous surf line. However, the best approach is to avoid these problems by navigating with care, which has the added benefit of leaving the coral alive so that others can enjoy it too.

Pagan Lee

A majority of accidents happen with barrier reefs, where there's a build-up of coral fronting a lagoon or estuary. The reef width can vary between 30 yards and a mile or more. It isn't unusual to find two or three feet of water over the reef at high tide. This type of grounding is the easiest from which to recover, given time and hard work.

Take the case of Dixie Lee and his 44-foot (13.5-meter) steel ketch *Pagan Lee*. Dixie is a caricature of the beer-drinking, fun-loving Australian hell-raiser. In love with life and the fairer sex, when we met him in the late 1970s he was 54, as strong as a mule, and perhaps as stubborn. His twinkling blue eyes and great shock of white hair belied an exotic past as a coastwatcher in the Solomons during World War II, and weekly trips into the New Guinea highlands as a surveyor when we shared a Melanesian anchorage.



A few hours can make the difference between breaking free with the hull intact and having a penetration through the hull. If your vessel is metal or heavily built fiberglass, you have more time than if she's wood; even a stoutly built wood hull won't last as long under the same conditions. In most cases a ferrocement boat can be written off as soon as she hits.

Aside from time, the most important ingredient is faith in the future. Never give up hope. If the hull is intact, somehow, at some time, in some manner you will be able to float her free.

In the tropics, where navigation aids are few and currents unreliable, coral reefs are the biggest hazard. This is a mixed blessing. Coral by its nature is abrasive, and will chew through anything less than metal, sometimes in an incredibly short time. On the other hand, most coral is easily crushed, and as such is not as liable to puncture a hull as rock. Also, the coefficient of friction between a hull and coral will be substantially less than between the hull and mud or sand.

Help

Dixie, another male crewmember, and several lady friends had been sailing *Pagan Lee* from Cairns, Australia, to Kieta on Bougainville Island in New Guinea. At 0230 on a dark, overcast night, they struck Long Reef, in the Louisidade Archipelago, southern New Guinea. With a 15-knot southeaster blowing and four- to five-foot breaking seas, it wasn't long before *Pagan Lee* was quite a ways up on the reef.

After getting out an SOS, Dixie and crew took stock. With a steel hull on the stoutly built *Pagan Lee* and moderate sea conditions, they decided to wait until daylight to take action. The SOS, broadcast on the 2182 distress frequency at night, was heard by several ports in the Pacific islands. Information was sent to search-and-rescue in Port Moresby, which launched two twin Otter aircraft at first light. Since Dixie wasn't sure of his position, not having had a fix since leaving the northeast coast of Australia, it was several hours after noon before he was spotted.

Aerial photos taken at that time show that *Pagan Lee* had been driven 100 yards in from the edge of the reef. With that much distance between the boat and the face of the reef with its breaking seas, and over a mile to go toward the inside lagoon, most skippers would have started removing valuables and salvaging what gear they could. But that wasn't Dixie's style, and the ensuing struggle should be considered carefully by all those who go cruising coral-strewn waters.

In the olden days, pre-GPS, this was one of the most dangerous areas in the world. The reefs were poorly charted, and overcast often reduced visibility for days on end. Pagan Lee was on a northeasterly course when she hit (dashed arrow) coming up from Cairns, Australia.

Today one knows his or her location quite accurately, but the charts of this area have not improved, and the coral keeps growing. Moral—keep your eyes open.

Dixie decided to work the boat toward the lagoon. He wasn't sure if there was a pass out of the lagoon, but he reasoned that he could always find a way through once he had *Pagan Lee* floating. They adopted a system of putting the bow anchor, a 45-lb. (20-kg) CQR on chain, out at a 45-degree angle toward the lagoon, coupled with a 50-lb. fisherman anchor angled on a nylon rode from the stern. With *Pagan Lee* thus bridled, and with the sails hoisted to heel her over, they winched like the devil for two hours on either side of high tide. At high tide there was 2 1/2 feet (76-centimeters) of water over the coral reef. On good days they moved her more than a quarter-mile. During the low-tide periods, the crew set out with two metal staves scavenged from hull repair stores and broke up large coralheads blocking their way.

Five days later, exhausted, and with *Pagan Lee* in need of a little paint, they kedged her into deep water.

In retelling his story, Dixie made three important points. First, under no circumstances allow the vessel to dig a hole in the coral when she first hits, thus trapping herself at the reef's edge. If this happens, without outside aid the game is over. Second, carry tools aboard suitable for breaking up the coral, such as a pickaxe. And third, if you're serious about wanting to have the maximum chance of freeing the boat, learn to use and carry explosives.

Pagan Lee was moderately heavy, of hard-chine steel design. Built of 3/16-inch (4.5-millimeter) plate framed on 16-inch (400-millimeter) centers, with longitudinals spaced at 12-inch (300-millimeter) intervals, she was as close to bulletproof as you can get. Yet Dixie thought that any modern, well-built fiberglass boat would also have survived. A lighter boat, with more freeboard, would have the advantage of floating more of her weight on the incoming tide.

Arion III

The other route out of this kind of trouble, obviously, is to get the boat back to the edge of the reef and through the surf. We had figured this would be impossible without outside help, until we heard the story of Dee Dee and Emory Moore's experience on the reef at Taka Lambaena in the central Indonesian archipelago.

The Moores had been sailing for a lot of years. Dee Dee was one of the terrors of Newport Bay in her Southern California racing days, while Emory cultivated his bedside manner as a top cancer surgeon. When the Moores decided to go cruising, they had a Bill Lapworth-designed Cal 2-46 built to their specifications. With roller-furling headsails, a modest rig, and a GM 4 53 diesel turning a three-blade 26-inch (63-millimeter) propeller, she was a conservative boat, easily sailed by a couple in their 60s. When we first met them we were in our mid-thirties and were in awe that these folks, almost old enough to be our own grandparents, could cruise on their own (now that we are grandparents ourselves we have a different view of what constitutes old age!)

Help

They were heading for Singapore, with Dee Dee handling the navigating. Not having had a sight for awhile, both she and Emory were on deck keeping watch. They were aiming for the center of a 10-mile-wide pass. Taking visual bearings on Kompo Isle in the early morning mist, they thought they were clear. Emory wasn't feeling well, and at the end of his watch went below. Not much later the sun peeked through for a moment and Dee Dee raced to get her sextant. The sight recorded, she considered asking Emory to come back on deck while she worked it, but he was resting peacefully and she decided not to disturb him.

Arrion III was sailing along under full main with the No. 1 genoa rolled down to 110 percent in a 20-knot southeast tradewind. The autopilot not working, they were using their Sayes self-steering rig with marginal results.

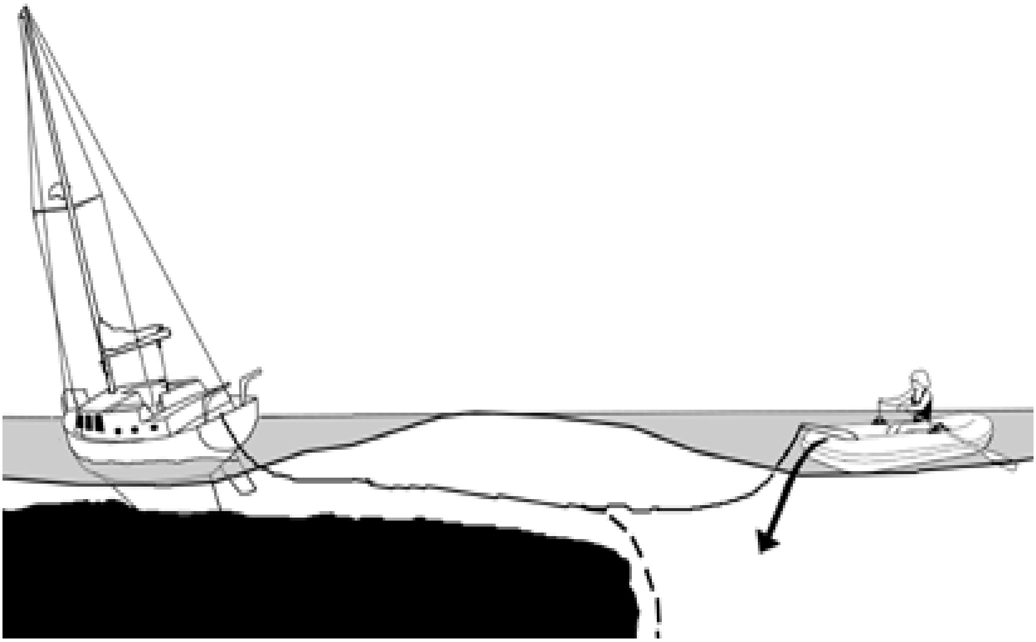
Toward the end of her worksheet, when she was just about through with the sight reduction tables, Dee Dee felt *Arion III* round up slightly. With horror she realized that the water through the starboard windows had changed color, and in a matter of seconds had run the gamut of blue, green, brown—then, slam! They were hard on a fringing reef with a tradewind sea breaking over the boat.

Rushing on deck, she threw the sheets off, then tried to free the stern anchor from its chock. The release pin was frozen. The engine was thrown into reverse, but to no avail.

Within minutes they were 50 feet (15 meters) in from the edge of the reef with seas breaking over the stern. While Emory shipped the self-steering rig and dropped the sails. Dee Dee got off an SOS on the 15-meter band ham radio, which was received in Guam. A group of amateur radio operators stood by to monitor the situation.

At this point in the story, Emory said, "I was starting to plan our new boat." That would have been our own reaction as well, but Dee Dee wasn't about to let that "goddamned Indonesian reef" beat her. Putting their eight-foot (2.4-meter) Avon dink over the side, they decided to try to set the anchor and winch themselves off. Bringing the Avon around *Arion III*'s stern, they found the seas too rough to transfer their 35-pound (16-kilogram) CQR anchor. The Avon was moved amidships and tied fore and aft. They laid the anchor in the bow and the chain in the stern. Using her seven-foot (2.1-meter) stoppered oars, Dee Dee rowed this blunt nosed little inflatable, towing a one-inch (24.6-millimeter) nylon rode through the breaking surf. Gaining the edge of the reef, she paused to drop the anchor and chain, only to be blown back into the break before she could get the anchor over the side. Once again, now rowing at an oblique angle to the waves, she worked her way seaward and this time succeeded in dropping the hook over the vertical edge of the fringing reef.

When Dee Dee got back aboard *Arion III*, exhausted, she and Emory started to grind in on their No. 28 Barient two-speed cockpit winch.



The key to success for the Moores in saving Arion III was two-fold. First, they acted quickly to get the boat off the reef. Second, Dee Dee was able to row their inflatable out through the surf. Note that in this sort of situation it is necessary to row well past the point where you want the anchor to end up—here over the face of the reef. Rowing past the reef face allows room for the anchor to drift back without ending up back in shallow water.

With the tide rising, they felt a first tentative thump, as *Arion III* eased toward deep water against the spring-like tension of the stretched nylon anchor warp. For hours they cranked and rested, then cranked again. Gradually, they began to edge into deeper water. An occasional wave, bigger than the others, would give them extra lift and a few additional feet of seaward progress. By early afternoon they fired up the engine, and with 100 horsepower working in tandem with the primary winch, they began to make real progress through the surf. Resting for a moment, they decided that *on the final lung the anchor rode would have to be cut free so that it wouldn't foul the propeller.* Their strength somewhat recovered, they gave a last effort, revved the engine up to full reverse, and cut the rode. With a final bounce they were free of the coral and backing out to sea.

The damage sustained by their fiberglass hull was superficial, and their spade rudder, although it was abraded and had shifted the quadrant, was in good condition.

By saving their vessel without outside aid in such a difficult situation, Dee Dee and Emory Moore set a brilliant example of what determination and seamanship can do.

The most interesting technical aspect of this story is the dropping of the anchor over the face of a reef. We had never considered this approach to working out of a fringing reef grounding, but as we've seen, it's a valid method.

It may be that help is available to pull you off, and in this situation a bridle will have to be rigged that can take enormous loads without doing major damage to the boat.

LEGAL ISSUES

So far we've been concentrating on saving yourself. But there are situations where outside help is available, and may be the only way of effecting an escape.

Common sense and the fine print in marine insurance policies dictate that the master of a yacht in distress take every reasonable precaution to protect his vessel and crew. If you carry insurance, the insurance company expects you to deal with emergency situations as if you were uninsured. Walk away from a mistake, and you may have a carrier who feels he doesn't have to pay.

If you do find yourself in trouble, there are two basic avenues you will have to consider. The first is accepting help from others, and the second, which we've been discussing in the previous section, is dealing with the situation yourself.

Some of the oldest laws on the books deal with just the subject of maritime salvage. If another vessel or individual renders you aid, he is entitled to fair compensation for that assistance. Anthony Mohr, a retired Beverly Hills, California, attorney (and now Superior Court judge), states that "federal law *requires* that the master of a vessel render assistance to a person found at sea in danger of being lost. Compensation is intended to offset this requirement. There are even penalties in the federal statues to be assessed if aid can be given but is not."

If you must call for help from outsiders, it is best to make an arrangement in advance over the fee to be paid. If you don't you may find your vessel impounded by a salvor's lien while you await the ponderous course of justice in the Admiralty court system.

Ben Weaver, a Fort Lauderdale, Florida, attorney specializing in Admiralty law, told us, "the claim a salvor is likely to make will depend upon the weather, conditions at the time, condition of the vessel, danger to her crew, value of vessel and cargo, and danger to the salvor's crew. If you run out of fuel on Sunday afternoon and accept a tow to the local fuel dock, the award is likely to be minimal. But if you are caught on a lee shore, with a dangerous sea running, the Admiralty court is likely to hold that a good percentage of the value of the vessel and cargo be paid to the salvor."

Obviously a small runabout will have to pay less than a large motor yacht. It is not unusual, however, with smaller or older vessels to find the salvage claim more than the boat itself is worth.

"On the other hand," Weaver points out, "the salvor must act in good faith, or the court may disallow his claim."

One of the best ways to avoid such legal entanglements is by looking at the various things that can go wrong and then planning how you will combat a potential crisis before you leave the dock.

Salvage with Outside Assistance

Enough depressing talk about the legal system. Let's concentrate now on getting the boat out of a bad situation using outside help.

Towing Bridles

A towing bridle is the first thing to consider. The loads on this gear will be substantial. The bridle must be attached to very strong fittings aboard in order to take the strain. Proper towing bits are rarely found on most yachts. Powerboats can rig a bridle clear around the hull, making ties to lifeline stanchions or through the bulwarks to hold the bridle up and in place while the towing load is distributed into the stern quarters of the hull, one of the strongest parts of the boat.

Sailboats have masts and heavy sheet winches, which make excellent attachment points for towing. Making up a bridle that uses a series of these "hard spots" will distribute the load throughout the hull and deck structure. Remember to have the bridle secured close to the centerline at the bow. This will help keep your yacht straight as she is pulled.

Another approach is to rig the towing bridle around the keel. This works well with strongly attached fins.

Dealing with Obstructions

It is often the case that a yacht in relatively good condition before the tow off begins suffers substantial damage on the way to deep water. Any rocks or large coralheads in the way are going to be a problem—more so than when the boat is driven ashore, in some cases, due to the power of the towing vessel.

The best way to deal with this issue is try to survey the route to be taken as thoroughly as possible. Often the tow boat can pull at a different angle so the obstructions are missed.

Breaches in the Hull

Before beginning to pull, any breaches in watertight integrity need to be dealt with, and the hull pumped as dry as possible. If there are areas of the hull weakened by the grounding, or subsequent pounding, these should be reinforced as much as possible before towing off where impact is liable to make the problems worse.

Provisions should be made to deal with major damage incurred in the tow off as well. This means having patches ready to slide over the outside of the hull, reinforcing materials, and perhaps a large supply of underwater epoxy. It also means having dive gear ready to use, pumps and their strainers ready to go, and hopefully a gas- or diesel-driven damage control pump on board.

The most likely area to be damaged is the rudder, followed by the keel, and then the hull. Measure these areas to deal with ingress of water.

Moonshadow

Let's go back now to Arutua in the Tuamotus. The remarkable series of photos which follow have been sent to us by George Backhus and deal with the salvage of *Moonshadow* from the reef (we discussed *Moonshadow*'s hitting Arutua starting on page 246).

These and subsequent photos George Backhus

Moonshadow has been rotated gently toward the sea by the French salvage tug and she is now ready to be pulled off the reef. Note closely how the bridle is rigged. There are two separate bridles made up from two-inch (50-millimeter) nylon. This wraps around the trailing edge of the keel (the keel on these boats is a steel weldment, bolted to the hull with four times the strength required by normal scantlings rules). The bridle is then supported around the hull by tying it to lifeline stanchions, chain plates. and the primary winches in the cockpit.

These vertical lines do not actually carry much load. Rather, they make sure that the towing bridle imparts its load as desired—into the trailing edge of the keel.

Help

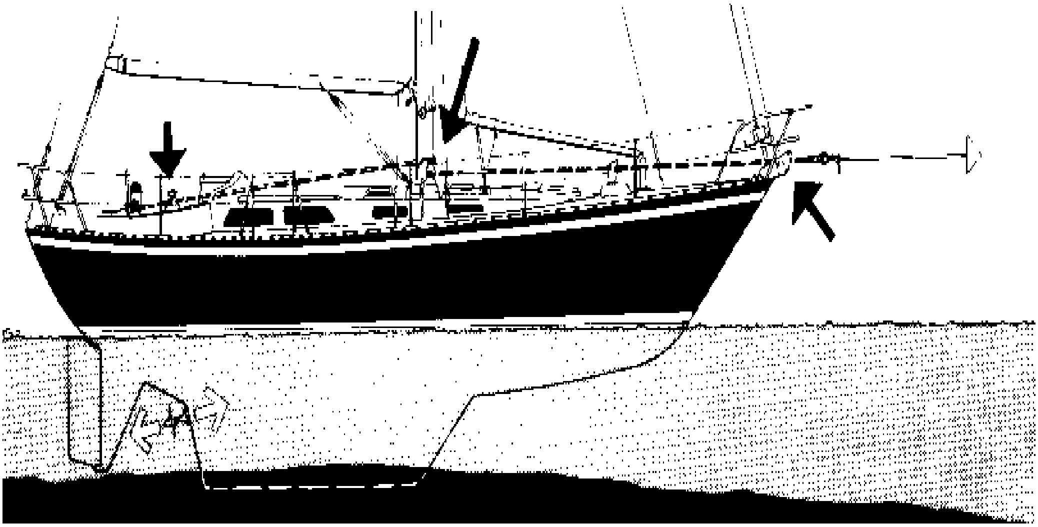
Everything is set and the tug awaits high tide. During the tow-off things went relatively smoothly. Moonshadow whacked a couple of coralheads, but did not suffer significant additional damage.

In the photo below she is on the ways in Papeete, Tahiti. Note that most of the abrasion has taken place in the turn of the bilge, where she lay against the coral reef. The bottom of the steel keel is hardly even scraped. There is a small three-cornered tear just under the fender by the upper black arrow. This actually occurred early in the grounding when she was dropped by a wave onto a sharp-pointed rock, bringing the full weight of the boat to bear on this point.

The bottom of the rudder (lower left corner) has been chewed off a bit during the tow-off. The rudder stock itself is intact as is the rest of the steering system. The fact that the bottom of the rudder is frangible (designed to fail first), helps keep the steering system operational. This spade rudder is designed to twice ABS standards.

Moonshadow was shipped as deck cargo to New Zealand and repaired there. As this was being written, she was happily cruising in Fiji.

Help



Towing

If the time comes when you need to tow another vessel, or be towed yourself, an understanding of the loads involved will be critical. This will have a substantial influence on how the towing bridle is rigged, and the speed at which towing is done.

Let's assume for the moment that the tower or towee is a medium-sized displacement vessel. If it is towed at a speed/length ratio of 1.0, i.e., at the square root of its waterline length, the loads will be a fraction of what they are as a speed/length ration of 1.30 is reached.

Add dynamic loads from sea state to the pure drag of pulling the boat through the water, and the loads can be difficult to deal with in a safe manner.

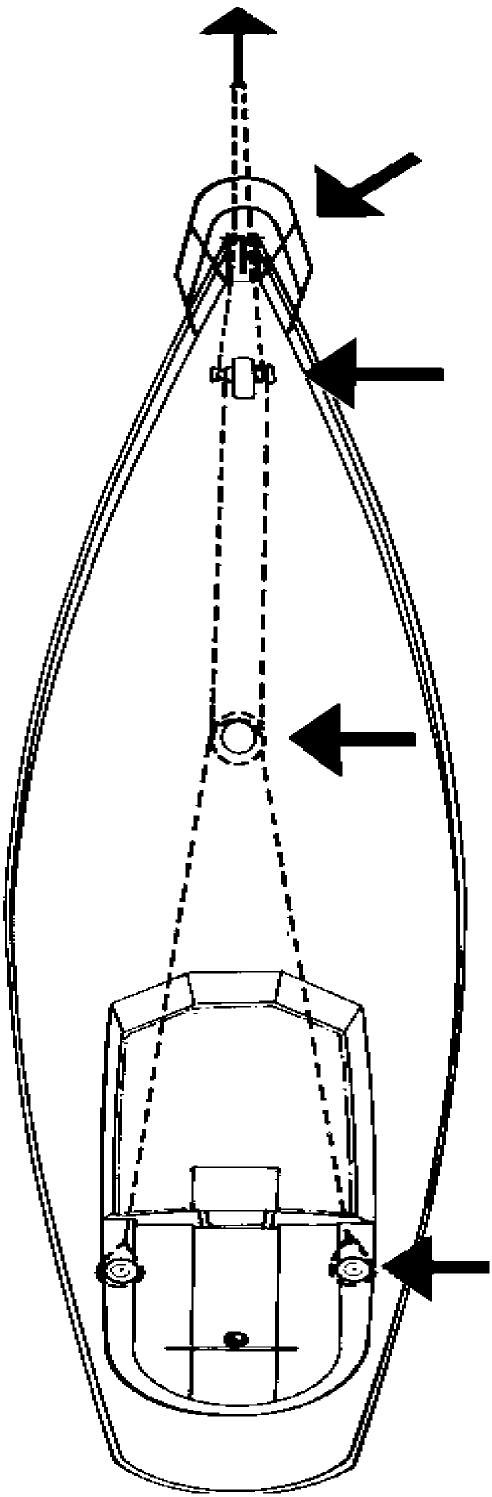
Towing Bridles

A towing bridle is the first thing to consider. The bridle must be attached to very strong fittings aboard in order to take the strain. Proper towing bits are rarely found on most yachts. Powerboats can rig a bridle clear around the hull, making ties to lifeline stanchions or through the bulwarks to hold the bridle up and in place while the towing load is distributed into the stern quarters of the hull, one of the strongest parts of the boat.

Sailboat masts and heavy sheet winches make excellent attachment points for towing. Making up a bridle that uses a series of these "hard spots" will distribute the load throughout the hull and deck structure. Remember to have the bridle secured close to the centerline at the bow. This will help keep your yacht straight as she is pulled.

Whether you are towing a vessel which is aground or floating freely, the basic structural issues are similar—the towing load needs to be distributed into structurally sound components of the boat. This applies to both the tug and the boat being towed.

Most sailboats can use a combination of the main mast and primary winches as hard points. However, when in doubt, and for powerboats, wrap the towing bridle right around the hull, holding it in place at the lifeline stanchions and chain plates.



Chafe gear will be needed at the anchor roller and around any deck hardware by which the bridle passes.

The load can be connected to the mast at the deck, if the mast is stepped to the keel and if it is well secured, but the primary loads should be taken on the sheet winches in the cockpit.

Shock Absorbers under Tow

Having aboard a large inventory of heavy nylon line eases the task of rigging a bridle. You will need enough to make several passes around the hull, with enough left over for the actual tow line for powerboats. Sailors have a ready inventory of sheets that will work in a pinch, although the Dacron used in these lines isn't as shock absorbent as nylon. Motor yachts can call upon their nylon anchor lines. If you have three heavy rodes aboard, they will probably take care of most situations. A substantial supply of chafing gear is also important: nylon reinforced vinyl or heavy rubber hose works the best. If you don't have extra it can always be scavenged from the plumbing system.

Communication with the Tow Boat

If you have to tow another boat, or accept a tow yourself, it is best to establish communications early to plan how the rescuer will approach the helpless vessel and at what speed the tow will be affected. Be sure to detail a crewmember to keep an eye on the tow line to help the helmsman keep it clear of the prop. If a direct radio link isn't available, try working out a system of hand signaling on speed. Once the tow starts, engine noise will make voice communication impossible except by radio.

A towing bridle should have already been rigged so all that is required is to hook up the towing warp. A heaving line with a weight attached can be used to establish a link between the two vessels and to pull the heavy towing bridle across. Start the tow slowly, allowing the following vessel to align herself gradually with the direction of travel. It is best to steer as much in the wake of the towing vessel as possible. Avoid getting out at an angle, as this position increases loads dramatically. If steering difficulty is encountered try dragging warps to keep you in line.

Picking the Right Speed to Tow

One of the most critical aspects of the tow is picking the right speed. You want to move as fast as possible to get back to port, but the loads on the towing gear increase with the square of your speed, and a small yacht being towed by a large powerful vessel can run into severe problems if towed too close to her hull speed. A tow at six knots will create better than twice the strain as one at four knots. On the other hand, maneuverability also has to be considered. Enough speed will be required so the tug has good steering control.

Tow Length

The length of the tow line will vary with speed, sea conditions, and steerage. The rougher it is, the farther back the tow will need to be. This leaves more line to absorb shocks. In a seaway always try to keep the boats one wave length apart, so they are both in the same relative rotational energy of their respective waves.

Towing in Close Quarters

As you get into crowded waters the tow length and speed will have to be reduced. Depending upon current, wind, and the berth, it may even be best to bring the two boats alongside for the final approach.

If you are doing the towing, and you feel uncomfortable bringing the tow into the dock, it may be best to have the disabled vessel drop her anchor once shelter is reached and wait for professional help or calm conditions for the trip to the dock.

If you do decide to bring the towed vessel into the dock remember that she has no reverse gear. She must be brought to the dock very slowly. When a cross wind is present, the slow speed will cause her (and you) to drift downwind, perhaps at a rapid rate.

Keep Propellers Clear

If you are assisting an anchored vessel, take care to keep your props clear of her anchor lines. As the anchored vessel surges back and forth, the increased strain on the rodes may cause them to pop to the surface. To minimize this risk, try floating a messenger line down on a cushion while stationing yourself well upwind. It can be used to pull across the main towing hawser.

Aboard the stricken vessel preparation should be under way to minimize risk if the anchors fail to hold. This means donning life jackets and garments to protect the body against abrasion on a rocky or coral shoreline. While it is almost always better to stay with an anchored vessel, if it is necessary to go ashore it will be best if a safety line can be established between shore and ship.

Throughout any emergency you must keep an eye on the life-threatening disaster if weather deteriorates. Obviously the faster you can get back under way and in control of your destiny, the better. Don’t dally just because the weather at present looks good.

Safety Issues

If a tow line fails under load it will whip back at each end, towards the tug and boat being towed. So if loads are high, the crew should always be as clear as possible from the risk of being hit by a failed tow rope.

The same holds true for staying clear of hardware. If a winch fails, you do not want to be on the loaded side of it! Stay behind all stressed gear and never allow crew to put themselves in the bight of the towing bridle or line.

If you are being towed, have a sharp knife or axe handy in case the tow line needs to be cut on an emergency basis.

Using Anchor Windlasses

Over the years there have been some terrible accidents with anchor windlasses being used for towing bits. Windlasses have relatively small center shafts and they are typically not as well-supported at the deck as are primary sheet winches.

In several cases of which we’re aware, the windlasses have failed under tow, and crew standing forward of the windlass have been seriously hurt.

Steering the Towed Boat

Depending on sea state, speed of tow, and vessel design, it may take quite a bit of effort to stay in a straight line while being towed. However, it is critically important to stay directly behind the tug to keep loads down.

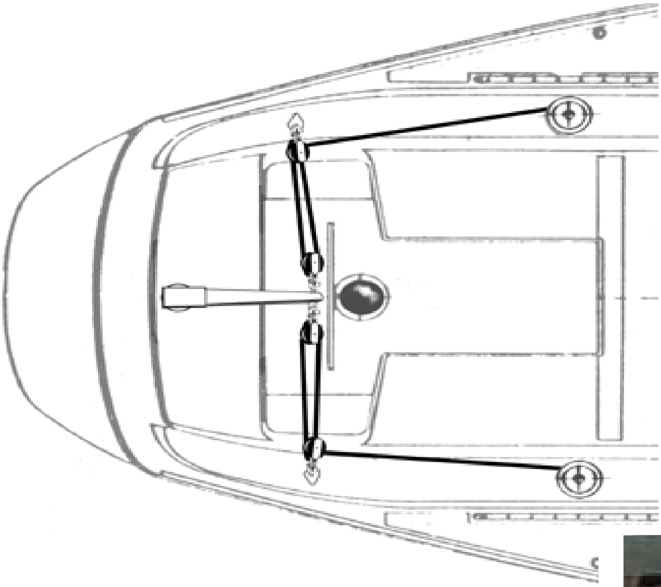
If the towed vessel begins to slide out to one side or the other, the loads on the towing bridle jump enormously. In addition, the anchor roller or other structure which takes any side load on the bridle, will see significantly increased loading.

Stay awake and stay alert!

Steering Failure

Steering rarely fails without warning. If the system is checked before each passage, and incipient maintenance issues are dealt with forthwith, the odds are the need for emergency steering will never occur.

On the other hand, losing steering will disable the boat, so provisions need to be made for getting under control again.



An emergency tiller will work for short periods without relieving tackles, but if you are going to be using it for any length of time, or in heavier winds, they are a necessity.

The size of the tackle is a function of tiller length and how easy the boat is to steer. Usually two-to-one is a minimum, but often four- or five-to-one will be required. The time to test and find out what is required is during sea trials. Then make up a proper set of tackles, test them, and stow them with the tiller

On Beowulf we leave the tackles attached on the tiller.

Emergency Tillers

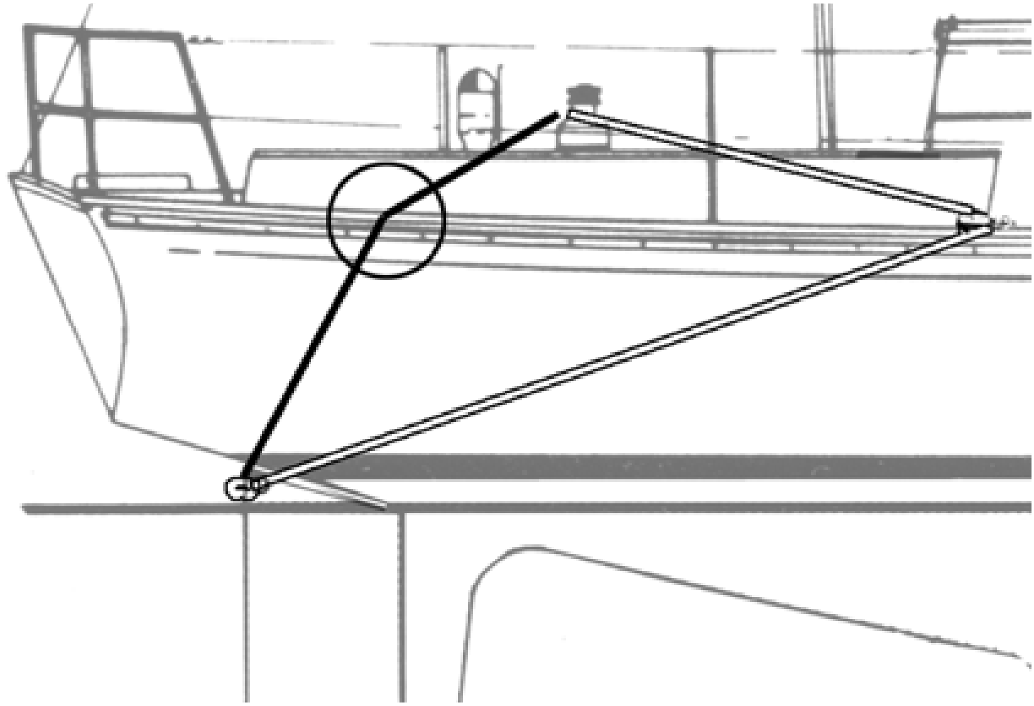
There will undoubtedly be an emergency tiller aboard, and the crew should be familiar with how it is used. A key factor is the structural integrity of the emergency tiller. Many are not strong enough for offshore work in waves, and failure, particularly at the connection to the rudder post, are common. (See *Offshore Cruising Encyclopedia*, page 545 for more information.)

The tiller will also not have as much leverage as the steering wheel so the work load is going to be much higher. The way around this is to rig a set of what are called relieving tackles to the end of the tiller. This can be made up from other running rigging aboard, or purposely made (we always carry dedicated relieving tackles on our boats).

The tiller can then be locked off, or steered using the lines from the relieving tackles. If the loads are high, you may want to take the line to a winch in the cockpit.

In adverse weather it is often possible to use these tackles under the protection of the dodger.

The emergency tiller on Beowulf (under the solid black arrow) is stored alongside the rudder shaft (inside the ribbed hose housing), with relieving tackles ready to go. It is normally used if we are heaving to in big seas to take the load if we are pushed back by a large wave. The dashed arrow points to the tiller socket.



In order for this system to work properly a hole needs to be made in the trailing edge of the rudder through which the control lines pass (and this has to be done when the boat is hauled out). If you have a high-density foam rudder, some form of external reinforcement will be required as the foam by itself may not be tough enough.

Keep the knots at the rudder as tight as possible to prevent slop (Spectra line is great for the connection). Then, bring the lines forward at a moderate angle, and lead them to a winch. This lead may be directly over the toe rail, or via a block on the rail.

Rudder Control Lines

If the emergency tiller fails it is still possible to control the rudder with control lines, secured to upper aft corner. These lines are then run to cockpit winches.

This is only practical where a large diameter hole has been pre-drilled, and then filled with a soft putty which can be pushed out if the need to use this system arises. Many older yachts with transom- or keel-attached rudders leave these holes open, ready to be used.

Bent Rudder Shaft

If you hit something, or the rudder shaft is too weak, it is possible the rudder shaft will be bent, or the bottom bearing on a keel-attached or skeg-mounted rudder will jam. This makes it difficult to impossible to turn the rudder.

This problem, can often be temporarily mitigated by easing the rudder quadrant and/or shaft clamp, and sliding the rudder down. This relieves the jam between the top of the rudder and the hull.

The Right Tools

The most common steering problems have to deal with loose connections of one sort or another—sometimes the quadrant itself, or the turning sheaves, or plumbing connections if there is hydraulic steering. These are often in awkward spots, and may require special combinations of tools for tightening. Make sure these are aboard before you head to sea.

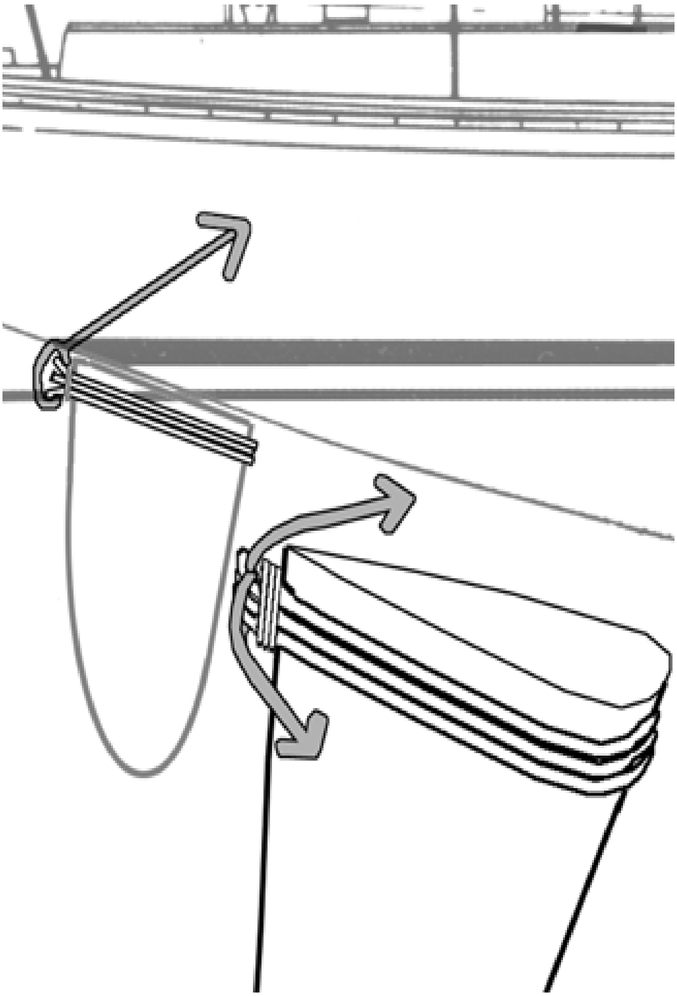
Help

Unorthodox Approaches

If the loss of steering occurs in moderate to calm conditions, and an emergency tiller or directly tieing to the rudder isn't practical, here are some unorthodox approaches that have worked on occasion.

With a spade rudder, it is possible to tightly wrap the top of the rudder with several strands of low-stretch line, then seize it securely at the aft end. This then connects to control lines as shown on the previous page. It is a much sloppier set up, but if nothing else is possible, will give you some control.

It is occasionally possible to use a large crescent or pipe wrench on the rudder head, and then a "cheater" pipe over the wrench handle which is in turn connected to relieving tackles. On a smaller vessel, an oar may then be lashed to the cheater pipe.



Rudder Loss

We've talked repeatedly about planning for the worst, and total loss of the rudder falls into that category. Racing boats are required to have a system to steer by in the event the rudder itself fails.

This typically takes the form of a second, smaller rudder which attaches to the transom or swim step with pintels and gudgeons.

This approach certainly makes sense for cruising boats, but is costly and takes up a lot of space. If a spare rudder is carried, make sure it is strong enough to do the job, and practice installing and using it.

And if you don't have an emergency rudder? It is always possible to rig up something from a spinnaker boom (or main boom) and other bits and pieces. Once again, however, it is a good idea to think through what you have aboard to use in terms of steering shaft, paddle, connecting devices, and tools.

The following story illustrates what we're talking about.

If you do not have a hole in the aft end of the rudder, another approach is shown above. The control will be sloppy, but it will get you home.

RIGGING A SWEEP

Skip Novak is a professional sailor who makes a living driving big mono- and multihulls. When he's not breaking trans-ocean sailing records, he runs an adventure charter business between the Cape Horn area and Antarctica aboard his steel cutter *Pelagic*.

Skip sent us the following story about rigging a sweep on *Pelagic*, which has excellent lessons for us all. He picks up the story from here:

"We all know those over-informative plan view drawings found in various 'How to Sail' books showing a spinnaker pole and two ropes led forward ending mysteriously somewhere in the cockpit. Of course, the reality of conjuring up this rig—and more to the point, making it work for long periods at sea in all weathers—is altogether a different matter. Fortunately, *Pelagic* is equipped with a proper tool bench with a vise, a comprehensive tool inventory and a good supply of unspecific repair materials. But confidence in this array didn't prevent a certain anxiety while Hamesh, David Hansworth and I spent an hour with our heads down in the bilge, sifting through grimy bilge debris, searching for an almost microscopic spring. This had accidentally popped out of the jaws of our hand drill, effectively stopping the project before it started. The boat meanwhile, rolled helplessly rail to rail."

Rudder Failure

During the afternoon of 10 December, *Pelagic*'s bottom rudder bearing holder parted company with the hull. Our position was the unenviable one of 52S and 94W in the Southern Pacific Ocean and *Pelagic* was on passage, 25 days out of New Zealand bound for Punta Arenas in Southern Chili. There we were to embark crew and provisions for a three-month climbing expedition in the Antarctic. This unfortunate rudder incident not only cast a black cloud over our already tight schedule, but gave us pause for thought about making it at all. We would soon be without steering 700 miles from the Straits of Magellan with the wreck-strewn, saw-tooth coast of Tierra del Fuego our lee shore.

Pelagic's rudder is retractable, as is her keel, and when the hollow section of rudder shaft between the two bearings inevitably snapped, we had already reduced sail to bring our speed down to a slow crawl. Attaching the spinnaker halyard to what was left of the rudder we managed to land the steel blade on board and lash it securely to the deck. Darkness came with a strengthening westerly gale and we spent a grim night hove to, each with his own thoughts. It required a certain amount of moral fiber to get up in the predawn at 0400 when first mate and jury rig artist Hamish Laird and I began the 10-hour construction of a spinnaker pole sweep.

Building the Sweep

Probably the most useful material we had on board which wasn't a sacrificial part of the boat, were long lengths of 10 millimeter (3/8-inch) threaded rod. These made possible a secure strapping arrangement of the 18 millimeter (3/4-inch) plywood floorboard to the pole by form-bending the three rods into giant U-bolts. Our first rudder blade measured 270mm x 780mm (10- x 32-inches) which, after first trials, was increased to 440mm and 920mm (17- x 36-inches) by bolting a bigger piece to the existing one.

Rigging Details

Two padeyes were then bolted to both sides of the blade at the outboard end where steering ropes were tied into a harness lashing. The ropes led to the stern quarters then forward to snatchblocks on the tail and were cross-connected over the cockpit with a Prual knot. In this way, both ropes could be worked from one side of the cockpit on two adjacent winches.

Help

For example as the winchman takes in the starboard rope, the port one is surged off the other winch. The spinnaker pole must ride on a saddle yoke. We carved a substantial hollow in our fender board and lashed it across the deck. Other lashings and control lines needed were:

1. A loose lashing holding the pole down into the yoke.
2. A figure-eight lashing around the pole anchored athwartships.
3. An outhaul led from the inboard end of the pole down to a block on the yoke and back to the deck winch. This is used to deploy the pole aft and prevent the pole from "skying" in the swell.
4. An uphaul rigged from the backstay to prevent the pole from banging the cockpit.
5. A short upright strut (we used a meter/39-inches) of aluminum angle fastened to the pole (with threaded rod), with two guys led athwart-

All photos Skip Novak

Working on the Mark II version of the steering oar, with increased blade area (above).

Below, note the U-bolts with chafing gear (Treadmaster non-skid material) between the steel U-bolt and the aluminum spinnaker pole. The pole rests on a heavy piece of timber (previously a fender board) to prevent a chafe problem between the steel deck and aluminum pole.

A detail shot (above) of the lashings used to hold the sweep in place. Note lashings over the athwartships lines and then under the pole, and then back again. The fender (below) is used to keep the sweep from dropping too low.

Sweep control lines were lead to a pair of cockpit winches (below). With a somewhat smaller sweep one could accomplish a similar amount of control using five- or six-to-one-tackles.

ships to prevent the pole from rotating.

By late afternoon the deck was cleared and our contraption rigged and ready. We slid the pole out through the figure-eight lashing, hauled in the outhaul and the sweep immediately came to life. Some jib was cautiously rolled out, steering ropes adjusted to give full travel, and with a hoot and a holler from Hamish, the bow bore off downwind and stayed there.

We rolled out more jib. It took some time to get used to working the winches. To say steering was easy is a gross overstatement, but it steered. Eventually we achieved 5 or 6 knots in the 30-knot tailwind and we steered directly for the Straits.

The success of this jury rig was, I believe, due to attention to detail in the building and then frequent retrieval and inspection for chafe. We lost only three days out of our intended passage time.

Rigging a steering sweep is a satisfying experience. It's also good for the arm muscles and a great boost to one's ego to arrive at your destination unaided, and cast that first mooring line ashore.

Help

PPL

Hull Damage

Collisions at sea resulting in hull damage are rare, and when they do occur, assuming you're keeping a watch, they will be between you and a floating log, cargo hatch, or perhaps a shipping container. Depending on your vessel's construction, you may want to make more or less elaborate precautions. Wood vessels, planked on frames, can be thought of as a series of small structures bonded together. As such, they're more subject to leaking from minor impact than metal or fiberglass boats. A metal boat, with collision bulkheads and perhaps a double bottom, will have little worry in this regard. Fiberglass vessels molded in two halves are potentially more fragile than one-piece hulls (aboard *Intermezzo* we carried a five-foot (1.5-meter) diameter pentagonal shaped collision mat, filled with 1/2-inch (12-millimeter) closed-cell flexible foam and fitted with lines tied to reinforced grommets around the outside on five corners).

After a collision, it's essential to quickly find the location of any leakage so you can assess the chances for stemming the flow. The odds are that the impact and damage will take place in the forward sections of the vessel. You'll have the advantage of working in a narrow part of the vessel's structure. This means that mattresses stiffened by locker doors or galley countertops can be forced against the leak and wedged in with timbers pressed against the other side of the hull. If the damage is at or near the waterline, tacking and heeling to the other side may bring the water flow under control until you can make repairs.

Not a fun day on the race course! This port/starboard confrontation resulted in major damage to both boats. Quick thinking and fast action is required in this sort of a situation to keep the boats afloat.

The first question is what happens when the boats separate? The level of flooding may increase exponentially once the "cork" of the bow is pulled from the side of the struck vessel.

Help

PPL

This vessel was on port tack when the impact occurred meaning the hole was on the leeward side and obviously well below the waterline.

Tacking and heeling the boat raises the open area of the hull out of the water and allows the crew time to work out some form of temporary repair, get the boat aground before it sinks, or make a more orderly operation of abandoning ship.

PPL

PPL

Major Leaks

Areas of potential leaks in every vessel should be catalogued and reviewed for control. The worst problem areas are keelbolts, through-hull fittings, and stuffing boxes (on both rudder and propeller shafts). Soft wood plugs should be available for through-hull fittings, along with a large quantity of underwater epoxy, (which has many other uses aboard). One possibility to consider when chasing a leak is a source above the waterline. It's amazing how much water will find its way below through unstopped chain pipes and cockpit lockers when you're reaching or beating in heavy going.

On our second crossing of the Tasman Sea, from New Zealand to New Caledonia, a high-pressure system passed over us the second day out, turning our lovely reach into a shy beat. The wind picked up into the 40s, and since we wanted to get north before the weather got worse, we kept pushing. I thought we must have a hull leak, as we had to pump the bilges for five minutes every hour. I made sure all through-hull fittings were tight, the shaft and rudder glands were okay, and the cockpit lockers weren't leaking. Two days later, still pumping hourly, I opened the sail locker forward to get a smaller jib ready, and saw a steady stream of water working its way down our chain. I had left the chain secured to our main anchor and had simply stopped the pipe with rags. The sea had taken them out quickly, and the hours of pumping were the result.

Just in case, I always keep a mask, snorkel, and a set of fins in the cockpit locker should an underwater inspection be necessary.

How about this for a busted nose? In this case heeling won't get the damaged area out of the water. But the major ingress of water can be stopped with a sail (or collision patch). If you are well offshore, without a watertight bulkhead, the odds are this will buy you a bit of time for abandoning ship, or maybe finding a shallow spot onto which the boat can be beached.

This is a really good advertisement for watertight bulkheads.

Evdenbach/Stock Newport

FIRE

Galley fires can be dealt with by keeping fire extinguishers, flour, baking soda, fire blankets, wet cloths, etc. readily available.

Once again, time and thoroughness is important. A small grease fire, initially easy to douse with a damp cloth, can lead to a burning fiberglass or fabric headliner if not attended to right away.

The secondary fire will produce large quantities of smoke driving the crew from the cabin. The fire then has the upper hand with no one left below to fight it.

Heavy weather, pirates, whales, even reefs barely concern us. But when it comes to fire, we are paranoid. Although we've never experienced a fire, we've seen the results, and they are painful to observe.

Reducing Fire Hazards

Fortunately, fire hazards are easily quantified and dealt with. They are primarily related to maintenance.

Most fires start due to electrical shorts on unprotected circuits. If you want a quick demonstration of how easy it is for this to happen, take a piece of 22-gauge wire and short it out on a 20-amp circuit. Be careful not to let it touch anything which will be damaged by extreme heat (including your hands). In a matter of seconds you will have a red hot piece of wire burning through its insulation. Anything combustible nearby would quickly be ignited, unless of course the circuit were fused in some manner.

So, rule number one is to make sure every circuit on the boat has a fuse with sufficiently small and fast-acting characteristics that it will open a circuit before the wire overheats. We include in this hot leads coming off the batteries, and the output of alternators, both of which can create fires.

Next, continually inspect wiring for chafe. This is particularly important where vibration is present—especially the engine.

The next risk comes from diesel fuel leaks around the engine. Most of the time this is not a problem, but if you have a very hot exhaust manifold,

Help

and a mist of diesel present, at some point this may ignite. Watch for chafe on diesel fuel lines—both fuel supply and return.

The stove, of course, is another source of fires—perhaps the most common aboard. However, these are usually small in nature and easily dealt with. Make a periodic inspection of the propane system—hoses, connections, and plumbing within the stove, and always turn off the propane at the tank (either with the tank valve or a solenoid valve).

In the olden days when sailing ships transported coal between ports, if the coal became wet, fire was common. The same applies to charcoal kept for the barbecue. If it gets wet, spontaneous combustion can result. If charcoal is aboard, keep it double-sealed to make sure it stays dry.

Finally, take care with oily rags. Keep them out of the sun, preferably in a cool spot, sealed in a metal container. Better yet, use paper towels and toss them overboard. If there are oily rags or towels in the trash, and it is on deck, keep it out of the sun, or located somewhere that if it does ignite, the heat will not create an immediate problem.

If You Smell Smoke

There are so many sources of combustible material aboard a yacht, and so little space, that only a minute or so is available to get a fire under control. Once smoke has filled the interior, it is no longer possible to work below.

Speedy action, the moment overheating or fire is suspected, is essential.

Since most fires start with the electrical system, typically the best initial reaction is to shut down power. If a circuit has just started to overheat, turning off the power removes the source of energy. You can then go about finding the culprit.

If the engine is running, and there is any form of modern fire suppression system, the engine must be immediately shut down. These systems depend on smothering the flames, and diesel engines (gensets and heaters too) will simply breath in the suppressant chemicals and send them out the exhaust—using up the fire suppressant.

Using Fire Extinguishers

The time to learn proper use of fire extinguishers is not when the chips are down. It is much better to get some instruction from your nearby Coast Guard safety officer or local fire marshall before the emergency. Barring such a demonstration, here are a few comments passed on to us by a retired fireman:

Fire extinguishers empty quickly, usually in eight to ten seconds. Trigger the extinguisher in short bursts, sweeping back and forth across the fire. Aim just ahead of the flame so that the extinguishing chemical sweeps across the top of the flames.

Check each pass (turning off the trigger) for aim and effect.

When the fire is out keep a careful eye on it. Odds are there will be a hot spot that may flash up again.

Fire needs air to fuel it. If the fire is in a closed compartment—maybe an engine room or locker with a genset—and the hatch is opened, there is a fresh gust of oxygen to feed the flames.

So, if you suspect a fire in a closed compartment, take care with opening hatches, and do so only if there is no other way to deal with the situation.

The same reasoning applies to a fire which has been controlled in an engine room. With the hatch closed, between lack of oxygen and the fire suppressant material, the fire may have temporarily gone out. But the minute the hatch is opened to check on things, if there is still an ignition source and fuel to burn, the fire may start up again.

Forster\Stock Newport

OVERBOARD

We can think of no worse situation on a cruising yacht than having one of the crewmembers go overboard. As a result, we've always been cautious about wearing a safety harness and hooking up. We were initially scared into this approach by reading Hank Searle's *Overboard*. It is an excellent cruising yarn, and one with a very realistic portrayal of what can happen. Give it a look.

But even if you're careful, have high, secure lifelines, and always wear a harness, the worst can still happen. So, we feel it is a good idea to be prepared for the worst.

From singlehander Chip Vincent, aboard *Eos*, we learned about trailing a trip line to disengage the windvane (if you reached it as the boat sailed past!). From Dean Kewish, another singlehander, we picked up the idea of trailing a long floating polypropylene line, knotted every two feet (60 centimeters), as a means of catching hold and getting back aboard (if the vessel isn't moving too fast). We adapted this to our doublehanded vessel by keeping a knotted and coiled line in the cockpit, ready to throw in case one of us went overboard.

Today most crewed boats carry a LifeSling for this purpose.

Personal Gear

There are a series of issues that need to be considered if you are going to be in the water. The first is maintaining enough freeboard for your nose and mouth so breathing air rather than water is possible.

The only way to reliably achieve this is with an inflatable life vest.

The next factor to consider is being found. A personal strobe light, pencil flares, and light-colored foulies with SOLAS reflective tape all help.

Many GPS sets have an MOB button. When used, these automatically give you range and bearing back to the waypoint when they were hit. The MOB waypoint should be initiated as quickly as possible.

If your GPS does not have this feature, replace it with one which does.

The importance of sharp, well-placed deck knives is not to be underestimated. A sheet or halyard, under load, will part almost instantly if a sharp blade is applied.

Once you're stopped, resist the temptation to start the engine until you have checked and double-checked that all lines are aboard. If you don't, the odds are that you'll end up in worse trouble with a mess around the propeller. Where possible, it is usually best to sail back to the victim.

In colder climates and even in the tropics over any length of time, hypothermia is a major problem. The best way around this is to wear one of the many forms of thermal foul weather gear that are now on the market. These foulies have insulation for flotation as well as insulation. Combined with sealable neck, wrist, and ankle openings, and some form of head covering, this gear can keep you functioning for much longer than would otherwise be the case.

Man-Overboard Procedure

In the event someone goes overboard several things should happen simulataneously. First, the man-overboard gear and any loose cushions should be immediately thrown into the water. The more "litter" the better as this will make it easier to find the area where the victim fell overboard.

If there are extra crew aboard, one or more crewmembers should keep their eyes on the person in the water at all times. Under no circumstances should they shift their focus.

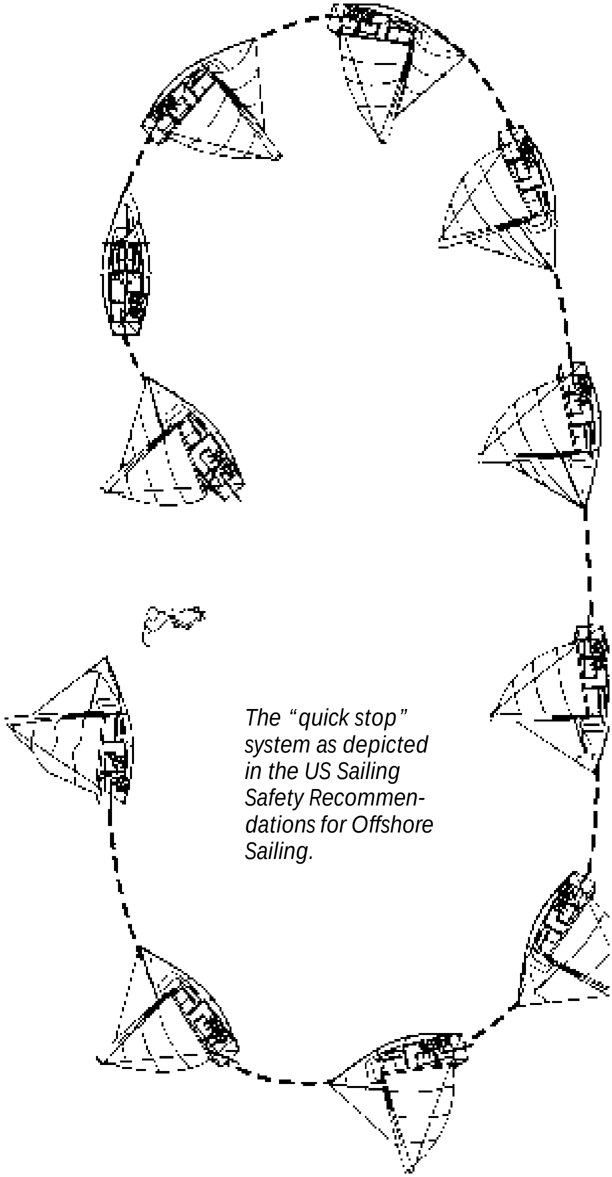
At the same time, the boat should be turned back, using the quick stop method described on the next page.

Quick Stop

The next step is to get the boat stopped as quickly as possible. Every second counts. Even at five knots, within 10 seconds you'll be several boat lengths away.

If you are sailing without a spinnaker, bring the boat quickly onto the wind, trimming the main as you head up. This will help drive the boat into the wind.

Continue turning past head to wind and onto the opposite tack, leaving the headsail cleated to weather on the new tack. Do not ease the sails unless the mainsail tends to hold you into the wind in which case it will need to be eased.



The "quick stop" system as depicted in the US Sailing Safety Recommendations for Offshore Sailing.

A man overboard sequence during Key West Race Week. In the top photo the crewmember has just fallen overboard and the MOM inflatable module has been tossed overboard. Note how far the marker is heeled in this light breeze. In a strong blow and big seas, it would be difficult indeed to find. In the second photo the boat has executed its quick stop maneuver and is coming back to recover their crew. The bottom image shows two men working to get the man in the water back aboard. This is extremely difficult, even in these moderate conditions—and often impossible when you are shorthanded unless some form of lifting device is available.

van der Wal/Stock Newport

Run downwind, with sails still trimmed in, until abeam of the victim. At this point furl or drop the headsail. (If dropping the headsail keep the sheets tight to keep it on board.)

Jibe the boat and head back towards the victim. If the wind and sea are rough, you will probably have to come alongside to windward and drift down on the victim.

Get a heaving line to the victim and bring him alongside.

Carrying a spinnaker requires more activity to get the boat stopped. To begin with, the spinnaker guys, sheets, and halyards should never have their bitter ends made fast or knotted. With all attachment points free to run, cast off the sheet first, then the afterguy, and finally the halyard and you will be free of the sail. (Never let the halyard go first or you'll end up running the sail down.)

After ditching the chute, the question of what to do next will be based on the sea and wind, and your ability to get back to weather. If conditions are moderate, it may be best to power back to weather (making sure there are no lines in the water before engaging the prop).

In more adverse conditions it may be impossible to power and you'll have to sail back.

Help

Using a LifeSling

The LifeSling, developed by the Seattle Sailing Foundation, is a marvelous piece of short-handed recovery gear. In essence, it is used in the same manner you would employ to bring a water ski towrope to a skier in the water.

The procedure starts out the same as with a fully crewed boat. Get markers and flotation gear into the water. Bring the boat head to wind, trimming the mainsail in the process. Once head to wind, allow the backed jib to help turn the boat downwind, while deploying the LifeSling. Once the float collar portion of the LifeSling is in the water it will drag out the rest of the line behind the boat.

Continue to sail in a circle, so that the line crosses the area of the victim. The swimmer then puts the LifeSling over his shoulders so he remains in contact with the boat.

Bring the boat head to wind, furl or drop the jib (and main if required) and then pull or winch the victim to the boat.

Maintain tension on the LifeSling so the victim cannot fall out of it.

Bringing the Victim Aboard

The difficult part comes once you get back to the swimmer. Assuming that he or she is in reasonable physical condition, that your freeboard is moderate, and that there's some breeze blowing, we feel it best to drift down from windward, in a hove-to position so that the swimmer can come aboard from the leeward side.

Some sort of a safety line needs to be connected either to the safety harness or under the arms and tightly around the chest. You do not want to risk losing the victim.

If the victim is lightly clothed and in good shape a combination of his and your efforts may be able to bring him aboard. However, there are numerous stories of two fit men having a devil of a time getting a third out of the water and back on deck.

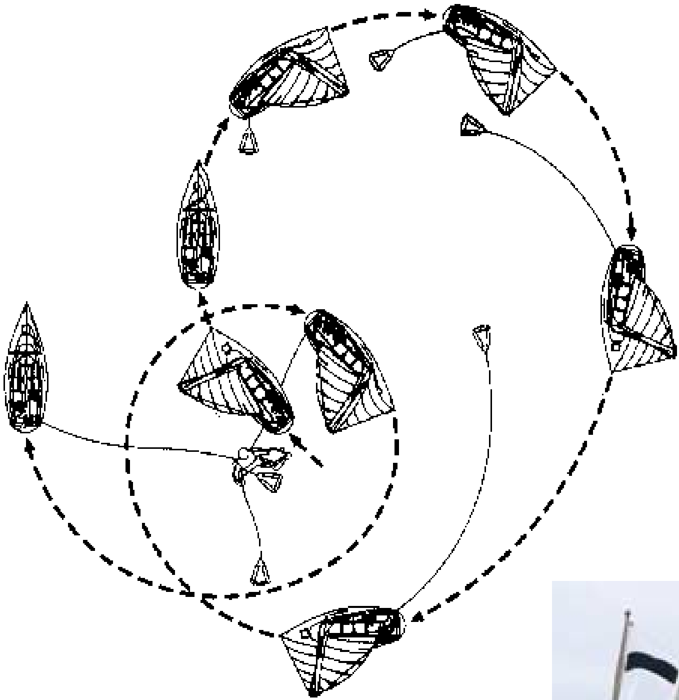
Short-handed, in the absence of a swim step, some form of hoisting device will be required.

This can be a halyard, or a tackle at the end of a halyard.

If the upper and lower lifelines are still intact, it will be very difficult to get the victim through them. However, if the lifeline ends are lashed in place (rather than using a turnbuckle) the lower lashing can be cut to make it easier to drag the victim back aboard.

Don't let this happen to you!

- ❑ Stay aware of the boat's motion.
- ❑ Keep clear of booms which could knock you overboard.
- ❑ Use inboard handholds rather than lifelines.
- ❑ Don't lean overboard to work.
- ❑ Walk and work in a low crouch, to keep your body's center of gravity lower.
- ❑ Always wear a safety harness.



If you sail short-handed (and even if you don't) carry a LifeSling. Then practice using it. Start out in calm conditions, as shown below, and then try your quick stop and LifeSling deployment in more boisterous weather.

Be particularly attentive to how the lifting mechanism is rigged. Powerboats, as shown here, will need to use the dinghy crane. Sailboats have more options. Usually a headsail halyard will be most readily available.

Keep in mind that the time to figure what is the best lifting system is not when someone's life is on the line.

West Marine

Help

If You're In the Water

Let's switch perspective for a moment and talk about some issues for the person in the water. To begin with, using the correct tactics to avoid heat loss and hypothermia, and then signaling your would-be rescuers is critical. But the most important thing is to keep fighting, to never give up hope.

Ted Sierks

The first story deals with Ted Sierks, a crewmember from the 73-foot (22.4-meter) cutter *L'Apache* in the 1951 Honolulu Race. Ted, a 40-year-old photographer from Catalina, was coming off watch at 0730 on July 11. *L'Apache* was sailing at 10 knots with a chute set, 800 miles from Honolulu, in 20-knot trade winds. A squall came through, she rolled her main boom in the water, and broke the preventer rigged to the bow.

Ted stayed on deck to help rig a new preventer. He was leaning out over the lifelines, against the boom, when the boat gave another heavy roll.

The lifelines gave way and Ted fell overboard. Very much in control of his wits, he grabbed the trailing taffrail log as it swept by, and was able to hang on, hydroplaning behind the boat, while the crew tried to get the boat stopped.

Eventually he was forced to let go, his hands lacerated by the log's propeller.

In the meantime the crew had tossed overboard two life rings. Ted immediately found one of these, and then shortly thereafter a second.

It took 11 minutes to get the chute down, the engine started, and the boat turned around. Twenty-six minutes later Ted could see *L'Apache* just a few hundred yards away, but they could not see him. Eventually a line fouled the prop, and the search patterns became much more erratic.

At the 0800 roll call *L'Apache* put out a Mayday man overboard call and several boats in the area diverted to search for Sierks. Amongst these were five US Navy destroyer escorts on maneuvers.

At 1230 the next day the official search was called off. However, the destroyer escort *Douglas A. Monroe* decided to make one more pass. Forty-five minutes later, two of her crew spotted Ted Sierks, and at 1313 he was pulled from the water—after 29 hours.

Lessons from Ted Sierks:

- ❑ Never depend on lifelines to keep you aboard.
- ❑ Wear a harness and keep it attached on deck.
- ❑ If a motor is used during recovery, double-check that there are no lines in the water which could foul the prop.
- ❑ Have a knife handy to cut sails loose. In the case of a spinnaker, cut the sheet, then the tack, and then the halyard.
- ❑ Don't give up.

1991 Halloween Storm

Another equally amazing story is that of the helicopter crew that was trying to rescue a cruising sailor during the 1991 Halloween Storm ("The Perfect Storm"). The crew were forced to ditch into huge seas due to running out of fuel. All but one of the crew survived and were picked up the next day by a Coast Guard vessel—and this in spite of injuries received by some of the crew during the ditch procedure.

The crew were wearing survival suits, and they were in the Gulf Stream where the water temperature is quite tropical. The critical factor was staying together, maintaining contact with each other until they were rescued the next day by a Coast Guard cutter.

Peter Noreng

A more current story occurred in the winter of 2000, during the annual migration from Europe to the West Indies.

Peter Noreng was sailing from Gran Canaria towards St. Lucia with four friends on a light displacement 34-footer (11-meters). They had been at sea for eleven days, and were roughly 700 miles from their destination.

Peter was off watch, sleeping below, with his life jacket still on when he got a wake-up call from the crew on deck. They'd gotten a spinnaker wrap in a squall, and after looking around for a moment he decided to take the helm.

Peter instructed the man on the tiller to bear off a bit, and then unclipped his harness to move aft to take the helm. The boat bore off quickly, and went into an unexpected jibe. The main boom came across and caught Peter on the forehead, knocking him overboard.

The crew could hear Peter's cries as they surged away. Within a few seconds they had tossed a life buoy over the side, with a light attached, hoping that Peter would swim to it. He never saw the light or float.

Then some of the crew stopped the boat, and got the chute down on deck, while another crewmember went below to hit the man overboard button on their portable GPS. The only problem was it did not have a fix at this time, and it was eight minutes before it acquired the needed satellites.

They put out a Mayday call on their VHF, worked their way back to where they thought Peter had gone overboard, and fired flares. At the same time they dropped buckets, cushions, and other loose gear off the boat, hoping Peter might come across some of it.

The crew maintained a rough search pattern, motoring slowly upwind, and then drifting back down until almost dawn, when they decided to rest so they would be fresh in the daylight.

We are indebted to Elaine Bunting of *Yachting World* magazine for the interview notes with Peter Noreng which follow.

The Search Process

Immediately after Peter Noreng was thrown into the water he started to despair. "I was lying there bleeding and thinking: 'This is it'," he said, "I've always said that if you go off the boat, you're dead. The first 15 minutes were really bad.

"Then I got my mind together and inflated my lifejacket. It didn't take them long to get back. They (the crew) did it pretty well. After 20 minutes, they were right next to me, a maximum of 200 meters (650 feet) away to windward, I could see them, but they couldn't see me. I shouted, but I was to leeward and the wind took the shouts away. I blew the whistle [on the lifejacket], but it was a joke, they couldn't hear it. I was whistling the whole time. After a while I got a technique. I used my finger to raise the pitch. But nobody heard it."

After hearing the Mayday, Johan Vogt-Svendsen, the skipper of *Mazy*, an Arcona 40, relayed the distress to the Norwegian Maritime Rescue Coordination Centre, which in turn contacted the US Coast Guard. Then he put out a call on the ARC radio net.

Five other ARC boats were within a night's sail of the position and responded: John Podbury in his Oyster 485 *Barefoot of Guernsey; Sonja*, a Bavaria 50 belonging to Wolfgang Poppel of Germany; Belgian Luc Carlier's 50-foot Colin Archer *Nelly Mathilde* and another Norwegian, Arve Johansson, on his Jeanneau 42 *Hildring* (only three weeks earlier Johansson had saved the life of a Senegalese stowaway whom he had pulled out of the water off the Canary Islands).

Throughout the night and the following day, Vogt-Svendsen helped work the search with two aircraft sent from the US Coast Guard base in Puerto Rico. It was difficult to estimate drift. There was current, but how much—half a knot? more?

The five ARC boats split into groups to cover as wide an area as possible along the estimated drift track. *Sonja*, and *Hildring* together zigzagged along 10-mile tacks downwind of the estimated last position of Peter Noreng, while the other boats searched further afield.

"The Longest Night of My Life"

At about 0300 local time, Peter Noreng saw a boat about two miles away. He believes it was a fishing boat; in any case it had a tricolor, which his boat does not have.

I started swimming towards it. About two hours later I was 100 meters (325 feet) behind it and started whistling. I thought they had heard the sound of the whistle because they shone a light round, but they couldn't see where it was coming from.

I was screaming my heart out, but the boat went off. That was a big psychological breakdown.

It was the longest night of my life. I didn't see any boats for the next six hours, but I didn't panic. I used my brain.

I played with my lifejacket and made a nice stressless chair out of it. I know about stars and I could watch the direction of the swell, so I was always very aware of direction. The inflatable lifejacket was good and warm and I kept going by singing bad Norwegian folk songs and keeping in the baby position.

But the wind got up and it was blowing 30 knots. It was very hard to breathe. I knew you could drown afterwards, so I didn't want to swallow salt water. I tried to keep my mouth shut, but you get water in your mouth when you're whistling and I started to get a very bad stomach. I was shitting big time. In the beginning I took my shorts off, but after a while I figured it really didn't matter."

At 0800 the following morning, Noreng spotted the Colin Archer on the horizon.

I was not aware that a search was going on, but when he jibed and came back I realized they were looking for me. I figured out the way they were searching and swam for my life. The boat did six passes, and I was so close three times that I could see their faces.

The US Coast Guard aircraft also searched throughout the day without once spotting him.

"The planes were too fast and too high, I didn't even realize they were looking for me."

The Hawaiian Shirt

Peter Noreng was steeling himself for another night in the water when he saw two boats in the distance, reaching back and forth towards him. He had been in the water now for 18 hours. He was sunburnt, dehydrated, had chronic diarrhea and painful knees from miles of swimming and treading water.

"This was definitely my last call, and I swam to break their course. I gave it my all."

His final effort took him about 1 1/2 miles.

Bur Noreng also knew he had to make himself easier to see.

I was in Prickly Bay [Grenada] last year. Let's say they had a certain dress code in one of the restaurants; the waiters were all wearing Hawaiian shirts. They wouldn't give out where they'd got the shirts, but when I was in Trinidad I saw the same ones and I bought the ugliest I could find.

The whole thing is a coincidence. I was so close to being picked up, so I took my green fleece off and pulled the stupid shirt over my head and used it as a flag.

It was this orange object in the water that *Hildring*'s crew spotted some 7 1/2 miles downwind from the original reported position. At first, they weren't sure what it was, but when they realized that it was Noreng they started yelling for joy. Arve Johansson and his partner Vera Sletto admit this was a highly emotional moment. Incredible, this was the second life they had saved in less than a month.

They threw a rope to Noreng, he swam round to their swimming ladder and they helped him on board. "We knew you have to be careful," says Sletto, "so when we got Peter on board we laid him down horizontally on deck. He was very thirsty, but we only allowed him small sips of Coke."

Noreng ate and drank "very, very carefully" for the next 24 hours, as he recovered on *Hildring*. He was still passing seawater three days later.

Nevertheless, he asked to be put back on *Jagermeister;* he wanted to finish the crossing on board. *Hildring* transferred him the day after the rescue.

I had some flashbacks. At times I lay in my bunk and cried.

Look at Eric Tabarly and so many other people who've disappeared; we lost three in Norway last summer. These were strong, athletic guys in the reach of helicopters with heat sensors.

The reason I was found was just pure luck. As they say, if you're meant to survive, you won't drown.

The search continued until late afternoon. There was a discussion about how long to continue. Water temperature was about 20 degrees Centigrade (68 degrees Fahrenheit). Hypothermia could still be some way off, but Noreng had been wearing only shorts, a shirt and a fleece. There was talk about calling off the search after 24 hours.

With about an hour of daylight left, crew of one of the Coast Guard aircraft flew over *Sonja* and *Hildring*. The yachts were coming downwind, about a mile apart.

At the end of their run, the pilot asked them to split further apart before returning upwind on one final leg.

Stopping the Boat:

Noreng has suggestions on boat handling: "If a man overboard happened at night, I would definitely stop the boat whatever it takes.

"Cut the halyards, do whatever you need to do. When it comes to human life vs. a part of the boat, forget about the boat."

Lessons from the Rescue

Peter Noreng is a highly experienced sailor. A merchant navy officer, he has also done over 100,000 miles under sail, including eight Atlantic crossings as skipper. He has skippered yachts from maxis *New Zealand Endeavour, LaPoste II, Moro de Venezia II I* and *IX*, to inshore racing boats.

Help

After reflecting on his 18 hours in the water, Noreng has strong views about how man overboard searches should be conducted and what equipment would have helped. He believes that he could have been rescued much sooner.

Search Times

With a water temperature of 20 degrees Centigrade (68 degrees Fahrenheit) or more, Noreng thinks he could have survived as much as two or three days. Yet the search could have been called off after 24 hours. "Don't give up the search," he says. "One day it might be you."

Vera Sletto of *Hildring* comments that if you find yourself in the water, you should not underestimate the efforts being made to rescue you and should fight to survive. "People will be trying everything that is possible to find you."

Lifebuoys, which had green night lights attached to them with capsules that had to be broken in order to flow, were thrown overboard immediately from *Jagermeister*. In Las Palmas, Peter Noreng and his most experienced crew, Karl Kjorstad, had discussed whether to break the capsules before or after throwing the buoys. "I said pull the flare and then throw the horseshoe. Karl said throw the horseshoe and then pull the flare if you find it.

"It went into the water and I never saw it." The crew had only one small torch and were unable to pick out Noreng, even when he was close. It is possible that a brighter light, such as an Aldis lamp, could have helped.

In the future, Peter Noreng says he will always make sure that he and crew carry personal equipment that will help them be spotted. "In future I will have a standard kit." he says. "It could be a small bag attached to the arm or leg and if you go on deck after dark you wear it. It would have one flare, one flashing light and one smoke dye.

"If I'd had that kit I would have been found in half the time."

Visibility in the Water

The orange shirt probably saved Noreng's life because it was easy to see and because he pulled it over his head—the only part of his body always above water. *Hildring*'s crew also commented that he had used his lifejacket to help him "sit up" in the water, and so more of the color was visible.

Lifejackets

The inflatable lifejacket helped save his life; he would not have had the strength to keep afloat for 18 hours and it kept him warm through the night.

However, Noreng is adamant that the plastic whistles fitted to lifejackets are useless.

Don't trust the whistle in your lifejackets—they are a joke. In the old days, Helly Hansen had football whistles. That is the only thing that works in the conditions you will find floating around in the ocean. In the water I thought everybody

Six or seven times boats were close enough to Peter Noreng for him to see their faces, yet they couldn't see or hear him. He now thinks actively searching delayed his rescue.

"If they hadn't started searching, I would have been able to see them and swim to them. I could swim 5,000 meters (3 miles) and I could see a boat 2 1/2 to 3 miles away. When I think of all the searching that night!

"If you have a man overboard at night, go back to the MOB position. Put all your lights on and drift along. You can only see 30-meters (90 feet) in those conditions. The person in the water might be able to swim up to you; that's your only chance.

"If you do search you should not compete with Nature. You've got to play with the forces. People were fighting to watch the compass when they could have steered by stars.

"My opinion about searching out of the helicopter range is that it has to be done straight into the wind or at 90-degrees to the wind. When you are broad reaching or running, you are not able to see more than 100 meters (325 feet)."

heard me. It turns out nobody did. A loud whistle, one with a pea, should be standard on lifejackets.

GPS Position

The handheld GPS didn't have a position at the moment Noreng went overboard. A fixed GPS with a permanently wired aerial might have been able to record an instant fix.

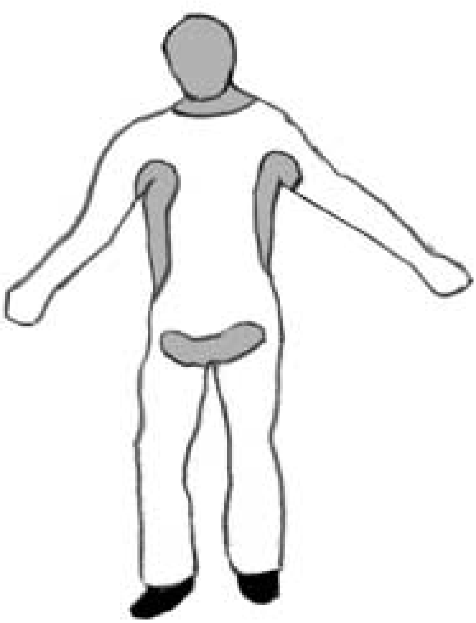
Accidents Happen

It is easy to be wise after the event. Iam fully aware that we were sailing an extreme boat, but this was human failure combined with bad luck. Our safety demands were very tight and we had done over 3,000 miles when the accident happened.

The boat itself cannot be blamed for this sort of incident. It could happen to any cruising boat out in the ocean; it might be autopilot failure, helmsman error or wind steering failure as the wind disappears at the bottom of a big roller.

HYPOTHERMIA

A related topic is hypothermia. We've seen how one can survive for half a day or longer in tropical waters. With the right equipment and techniques, you can also survive for long periods in colder climates as well.



Do everything possible to protect the areas shown above (head, neck, feet, groin, underarms and sides of chest), from direct contact with and movement in water.

Hypothermia occurs when the core of the body is cooled below a critical point, typically below 95 degrees Fahrenheit (35 degrees Centigrade). As a person becomes hypothermic muscle control and coordination becomes difficult and the brain starts to perform erratically. Changes in personality, such as uncooperativeness, are common. At 97 degrees Fahrenheit (36.1 degrees Centigrade) the first symptoms start with shivering. Shivering comes on gradually at first, then accelerates rapidly as the core temperature reaches 90 degrees Fahrenheit (32.2 degrees Centigrade). Beyond this point shivering typically stops and the core temperature plummets. Below 90 degrees Fahrenheit hallucination and heart problems begin, and by 85 to 83 degrees (29.4 to 28.3 degrees Centigrade) the body enters a coma and heart failure occurs.

There are several areas in the body where the blood supply passes close to the surface. These areas are the head and neck, underarm and chest sides, and groin. To the extent that you can protect them in some fashion, either with clothing or the position you assume, you can extend the period of immersion that is survivable.

Help

Keep On Your Clothing

Many people think you should shed shoes and articles of clothing when you are in the water as these weigh you down. However, for the most part clothing is neutral in buoyancy, and if you have a life jacket of some sort, the shoes and clothing will reduce your body's contact with the water.

Heat-Lessening Posture

To reduce heat loss keep your head out of the water, hold the inner sides of your arms tight against your chest to protect your armpits, and then bend your knees and pull up your legs so that your thighs help protect the blood flow in your groin area.

If you are in the water with other people, huddling together and hugging each other tightly can help reduce each other's heat loss.

Swim or Float?

Peter Noreng swam towards his rescuers. You can get away with this if the water is warm enough, and there is no other option. However, swimming pumps the blood supply around the body thereby lowering body core temperature. In cooler waters, it is almost always better to assume the heat-loss position and avoid movement.

Thermal Protection

If you are wearing a cold weather work suit or float-coat which is designed for cold water immersion, there will be ties at the ankles, wrists, and neck, along with a tight-fitting hood to reduce heat loss.

Float coats often come with a "beavertail" flap which closes off the bottom of the jacket to protect the groin area, and hold the jacket down on your torso.

If you have this gear, practice with it *in the water* so you are intimately familiar with the operation of the closures.

Recovery

Most detailed marine-oriented medical books will have chapters covering the process for helping a hypothermic crewmember recover. What we want to do now is leave you with a couple of basic concepts.

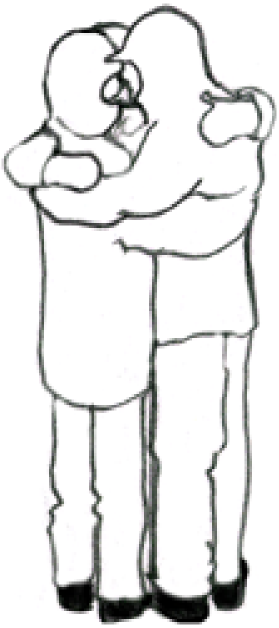
First, hypothermia is often a difficult condition to diagnose. Always assume the worst, and treat the victims accordingly. Second, you want to do everything possible to keep the victim quiet, and to prevent sudden flow of cold blood in the extremities to the heart, where the sudden shock could cause heart failure.

Keep the victim horizontal. If you have to move the victim, do it horizontally. When the head is higher than the heart it forces more blood through the system, increasing the risk of shock and/or heart failure.

Next, immediately work to stop further heat loss. This can be as simple as using a large garbage bag, with a hole cut in the top, over the torso of the victim. Get the victim dry as quickly (but gently) as possible, and keep them out of the wind.

The heat-lessening posture (above) reduces the area of the body in direct contact with the water. Feet are on top of one another, legs are tightly crossed (which helps legs and groin) and arms are crossed over the chest in such a way as to protect armpits and as much of the side of the chest as possible.

The most important thing is keeping the head and neck as far out of the water as possible.



If you have company, huddle together as shown to use each other's bodies as insulation from direct contact with sea water.

If there is any wreckage nearby, a clump of seaweed or even a dead body, use it to get as much of your own body out of the water as possible.

Find a heat donor, someone who can snuggle the victim. The ideal situation is to remove the victim's clothing and place him or her in a sleeping bag with another person.

Finally, do not give alcohol or cigarettes. Both work to dilate the blood circulatory system, promoting the movement of cold blood from the extremities to the heart.

Regardless of how well a victim says he or she is feeling, continue the treatment. Their outside may begin to feel warm, and some of the hypothermic symptoms may subside, but the victim is probably still in a very fragile state.

Staying Alive In the Water

We've included the previous examples to show you that you can stay alive for a much longer period than is generally considered possible. There are several keys. First, as we've seen with Peter Noreng, is the right mental attitude. Rather than giving up, he continued to fight. That's the same approach as the helicopter crew and Ted Sierks of *L'Apache*.

Physical conditioning is another factor. Obviously the better the shape you are in, the more you can do to save yourself.

Another issue is your personal freeboard; the distance which your head is out of the water. The more flotation you are wearing relative to your body mass and density, the higher your head floats. In smooth water this isn't a major issue. But at sea it can be the difference between survival and not being found alive.

The higher your body density, in other words, the more muscle and less fat you have, the more flotation is required. Bottom line: get the life jacket or inflatable vest with the most buoyancy you can find.

Prop Fouls

Fouling a prop is too common an occurrence to really come under the category of a true emergency, yet it does occasionally lead to the loss of a yacht, so perhaps a sea story is worth telling.

It had been a nice sail. We'd been reaching all day with the big Yankee jib, staysail, and single-reefed main. *Intermezzo II* was going like a freight train in the fresh tradewinds, and we were feeling pretty good. After all we'd hit our landfall right on the nose after seven days at sea, and to leeward lay the entrance to Colon, Panama.

As we headed into the wind to drop our headsails we were thinking ahead to new faces and a meal out at the Colon Yacht Club. Below, the kids cleaned and polished, bringing *Intermezzo II* to her usual post-passage sparkle.

With headsails secured Steve fired up the diesel for our entrance, and without a thought put the prop into gear. The engine grunted, and died, leaving us looking at a rapidly approaching lee shore. A tightly stretched jib sheet, disappearing over the side and into the water aft, indicated that our prop had eaten *another* sheet! With the water too deep to anchor, we quickly re-hoisted main and staysail and beat offshore to gain sea room.

We had two choices: sail her in, or clear the foul. With the hull bobbing about in the tradewind seas we felt the sailing was the easier solution. Ego may have had something to do with the decision as well.

It wasn't long before we were comfortably anchored in the outer harbor of Colon. After furling the main and putting away the headsails Steve set about to clear the prop.

Now, we would love to be able to tell you this was our first experience with a line wrapped around the prop. But that would be like saying we'd never touched bottom with our keel. Over the years we've managed to snag anchor rodes, dinghy painters, as well as the occasional headsail sheet, so we had some degree of first-hand experience to guide us.

Clearing a Foul

Steve soon had on his bathing trunks, snorkel, mask, and fins. Once in the water it was clear there was a partial wrap around one blade and the propeller hub. Had we thought to restart the diesel and pop it in and out of reverse, we might have saved ourselves a lot of trouble. The odds were that we could have unwound the foul without the swim.

Subsequent experience has proved that if the wrapped line is heavy (in our case it was 3/4-inch /19 millimeter Dacron), and secured aboard, it's usually possible to reverse your way out of trouble.

If you're heading over the side to work on a prop foul, there are some considerations before you hit the water. The first is sea condition. If it's calm, no problem. But with some wave action, you'll have to think about protection from the hull and running gear. And even if you're an experienced diver, a safety line and/or buddy in the water with you is a good idea.

Second is the boat's bottom condition. A smooth bottom, or one with a coating of slime or grass is okay, but an underbody with patches of barnacles can be extremely dangerous, even in calm waters. It's tough enough working underwater without trying to keep from grating your body against these sharp crustaceans.

If the water temperature is much under 75 degrees Fahrenheit (23.8 Centigrade) and you'll be in the water for more than a couple of minutes, wear a wetsuit and weight belt. If a sea is running or the boat bottom is at all rough, the wet suit provides protection as well.

Next, a good mask and snorkel are essential. The mask must fit well, and have a very secure strap to prevent it from being bumped off. Even though you won't be doing much swimming, fins are a help in holding you in position as you work.

We've found scuba gear to be an encumbrance in most instances, except where a particularly bad foul necessitates substantial periods underwater.

Last and most important is a sharp knife with a lanyard attached to a belt or a loop around your ankle. If you can shave the hair on your arm with it, the blade's just right. Remember, you'll be working underwater on what may be a densely wrapped mass of partially melted rope. The sharper the blade, the easier your job. A serrated knife edge cuts better in some cases. As a last resort a hacksaw may be used.

Before going overboard make sure the engine is disabled to prevent an accidental start. Next, assign a crewmember to keep an eye on you and be available to hand/or retrieve dive gear and cutting tools.

Back aboard have a look at shaft alignment by turning the engine over slowly. Stopping the engine with a wrap will sometimes induce a bit of bend or misalignment. Checking the bolts on the strut where they enter the hull is also a good idea. Even if the shaft looks straight, keep an eye on the stuffing box and strut bolts. A slight bend in the shaft may vibrate things to the point where a leak occurs.

Abandon-Ship Preparation

Emergency preparations in general, and abandon-ship procedures in particular, are unpleasant subjects. Nobody likes to think about worst-case scenarios. And while the statistical chances of having to take to a life raft or dinghy as you watch your yacht sink beneath the waves are remote, it's still a good idea to prepare for the worst.

The type of precautions you take should relate to the cruising being done, the exposure that your crew is likely to have to the elements, and the type of rescue facilities available.

With most cruisers, passaging will be along shorelines in close proximity to other yachts, Coast Guard, and commercial shipping, with aircraft overflights in range of emergency locator beacons. This type of cruising indicates the probability of a relatively fast rescue. Preparations here will be oriented towards minimizing exposure to the elements and being able to contact outsiders to pass on your message of distress.

On the other hand, if you're voyaging offshore, outside the shipping lanes, the possibility exists that you'll be on your own for weeks or even months. You should be able, in this case, to sustain fluid and food intake while making progress towards a landfall. There are several instances of cruisers surviving for months on end in life rafts.

Another major consideration is the likely air and water temperature. The major factor contributing to loss of life in abandon-ship situations is exposure to the elements. If you're forced to take to a raft in the Gulf Stream or the South Pacific, the elements will be relatively friendly, yet precautions must be taken to keep body temperature at reasonable levels while at the same time being able to provide shade from the sun. In less temperate climates even a few hours of exposure can be fatal.

It's a basic tenet of seamanship that you're almost always better off in your yacht than in a life raft. It's not at all unusual in instances of people abandoning their yachts, apparently in sinking condition, to have the yacht found afloat some time later. In some of these situations loss of life occurred due to exposure which might have been avoided if the crew had stayed with the mother ship.

Carefully review in your mind what sort of circumstances would dictate abandoning ship. Fire is obviously a condition that will drive you towards a life raft. There's a brief amount of time in which a fire may be contained or smothered, but once it really gets going it will be impossible to stop.

Apparent sinking is a little more difficult to gauge. If the leak is of less than monumental proportions you may be able to stop it or at least slow it down enough until help arrives. If sea conditions are rough and you're in danger of swamping as buoyancy is lost, that's another factor to consider. A major breach of the hull, perhaps resulting from a collision or structural failure will leave little time for contemplation.

Far more difficult to estimate is the danger from heavy weather. In the Fastnet Race disaster of 1979, numerous crews took to the *apparent* safety of their life rafts after suffering capsizes. Of the deaths that resulted from the storm, most were attributed to the problems of coping with exposure in the life rafts. A large percentage of the abandoned yachts were later found afloat. It's almost always better to stay with your yacht in heavy weather if she is reasonably seaworthy.

In almost all cases staying with the mother ship, as opposed to getting into a dinghy or raft, is safer. Consider the following:

- ❑ The mother ship is larger and much easier to spot by rescuers than a raft.
- ❑ Shade from the sun and protection from hypothermia is better on the larger vessel.
- ❑ In heavy weather more can be done to avoid capsize in the larger vessel than a raft.
- ❑ Even if the mothership is disabled you may be able to get it moving again when conditions moderate.

Of the abandon-ship situations we've studied over the years in probably 75-percent or more of the cases the abandoned vessels were later found afloat, or washed ashore—sometimes months after being left. Often some or all of the crew that got into the raft were lost.

Abandon-Ship Drill

An abandon-ship drill should be held on a regular basis so everyone is familiar with his or her job. In the event of a true emergency the ability to do the assigned task in a fast, orderly manner may mean the difference between life and death.

There are three basic areas of action that will need to be rehearsed. First, the life raft and/or dinghy should be prepared. If a sea is running it's usually best to wait until the last minute before throwing the life raft overboard, as they have been known to break their tethers when hit by a wave. If the dinghy is going along as well, be sure to bring the oars, sea anchor, sailing rig if available, and your ship's fenders (which make excellent flotation).

Someone should be gathering up emergency supplies. Hopefully these will have been packed in advance in emergency bags, each of which will have positive flotation. Most important is fresh water. Next are warm clothes and blankets. Even better are wetsuits or survival suits, which should be donned before going overboard.

Keep your EPIRB up to date. Most vessels venturing offshore these days carry an EPIRB. When you purchased this unit, you filled out a registration card. This registration needs to be periodically updated. Where and how to update varies with the country, but nowadays most allow you to do this over the internet.

Batteries are typically good for five years. Be sure to keep yours up to date.

While all this activity is going on, someone should be on the radio giving your position and an assessment of the situation. The US Coast Guard suggests that the following radio procedure be used: First, give a Mayday call three times. Then state the name of the vessel and nature of distress (sinking, fire, heavy weather). Next, and most important, give your location. It's best to give your geographic coordinates stating latitude first and then longitude. If you don't have this data available, try to give a bearing and distance off from a known landmark. Loran coordinates can also be used to fix your location. Finally, the Coast Guard requests that you tell how many people are aboard. This will enable the rescuers to follow up on the initial rescue if all aboard are not accounted for.

Coast Guard Search and Rescue suggests that you lock your transmit key in the on position when you abandon ship. This allows the rescuers to home in on the signal while your vessel is still afloat. The longer that signal stays on the air, the better the chances of your being quickly found.

Abandon-Ship Supplies

Our preference is to carry abandon ship supplies in sealed containers, outside of the raft. These containers have positive flotation and long, floating lanyards for attachment to the raft. We store these in a secure seat locker when we are offshore. The rest of the time they are below in one of our aft cabins.

The primary item is a 406 mgHz EPIRB. If you are buying new, look for a unit with integrated GPS, which cuts down the searching time dramatically.

Beyond this what you prepare depends on how long you could be exposed. Here are some suggestions of how to approach the "ditch kit". The following suggestions are a start, and assume that your raft already has basic supplies.

Short Term

If you are close to shore, and expect help within minutes or hours, the primary issue will be protection from the environment. Thermal blankets, Polartec-style fleece, chemical heat packs, thermal gloves, watchcaps and gloves, all help. If you are in cold water and the raft does not have a double floor, some form of air mattress to insulate the occupants

Help

from the raft floor is essential. A moderate first aid kit (including an enema sack for helping to deal with dehydration), is vital. Several hundred feet (60 meters) of quarter-inch (6 millimeters) line should be included, as should be a basic multi-tool like a Swiss army knife, and one or two flashlights, with extra batteries. We also carry a dozen 25-millimeter SOLAS-grade red parachute flares.

Most important of all is a battery powered VHF handheld radio and a handheld GPS for communicating with potential rescuers. We put the highest quality batteries in these units, and change them every four months. Several sets of spare batteries are carried as well. Batteries and radio/GPS are sealed in watertight bags (we vacuum pack ours).

Medium Term

As the term lengthens from a day or so out to several days or weeks, the primary focus shifts to water and food. You may want to carry a portable, hand-operated watermaker. However, keep in mind that these take a lot of energy to operate. We have a five-gallon (20-liter) plastic jug which we fill 80-percent with fresh water (so it floats) alongside our raft.

Food and medical supplies will depend on your individual needs. In our family, for example, where asthma can be a problem, special medication is carried to deal with this. We also have some food allergies, specifically to preservatives, so the high-protein energy food in our ditch kit is carefully checked, and tested to make sure there are no problems.

Water being the major issue, give thought to catchment, storage, and distribution. A small plastic tarp with grommets in the corners can be exceptionally useful for this and other purposes, as can a variety of sealable plastic containers.

Long Term

We used to always think in terms of months rather than days. But with the 406 mgHz EPIRBS rescue is likely to come sooner rather than later—as long as the EPIRB is operating properly. If you don't want to trust this technical marvel for your survival (we certainly don't) more supplies will be needed in all categories. Included are additional food supplies, vitamins, fishing kit (with 100-pound test monofilament, heavy leader, and a variety of hooks), and a gaff. The medical kit should be beefed up with antibiotic and fungal creams as well, and you will want to carry some form of pilot or general coverage charts as well as writing materials.

Miscellaneous Gear

You will want to carry copies of your passports, boat documents, and insurance data. In addition, if you end up ashore in an uninhabited location additional supplies, such as waterproof matches, flints, and a wire saw may prove invaluable. Finally, reading material, especially that which deals with survival in rafts, may be inspirational as well as a help.

MAINTENANCE

Since the beginning of this book we've been emphasizing that routine preventative maintenance is a key factor in successful seamanship. By checking all systems and gear on a routine basis the problems are usually spotted while small, when they are easy to deal with.

Something as simple as a broken hose clamp and a faulty bilge pump, and the boat ends up on the bottom. It is much better to stay ahead of these issues!

But what happens if you don't have competent help to deal with the issues? And how do you judge whether the local trades people are competent?

The best way is by knowing how to do your own work. You may, in the end, hire someone to help out or do the job entirely. But if you are capable of doing it yourself, you will be way ahead in your ability to judge the skill level of the folks with whom you are talking.

And if help isn't available, you will be able to do what's necessary yourself.

Fortunately, a majority of the systems aboard modern yachts are *relatively* simple to maintain and repair. If you understand the basics (which are not hard to learn) of rigging, sail repair, diesel mechanics, electricity, and refrigeration, just about any job that comes along can be handled. The amateur may not be as efficient as a fully trained mechanic, but in conjunction with proper service manuals, a good tool kit, and some onboard training from "experts", you should be able to handle just about anything.

The key is to be prepared in advance. This means having the right spares, technical data, and some familiarity with onboard systems. Years ago, before starting to cruise offshore we spent time with experts on every piece of equipment on our *Intermezzo*. While

Help

recording our conversations on cassette tapes (and logging each topic on a master list), we reviewed symptoms of common disorders, quick and permanent fixes, and then checked to see that I had the correct tools for each of the jobs that might crop up.

This procedure took just 12 hours and has saved us literally thousands of dollars (not to mention frustration) over the years.

Of course we were both harried beyond belief in those days, trying to get our personal affairs in order so we could leave and the tendency was to hire help when a project needed doing.

Then one Saturday the head packed up. We were tied up in our marina, and normally used the shore facilities, and we really wanted to go sailing. But then we realized that the moment had come to start taking responsibility for our own maintenance. In short order the head was unbolted, taken ashore, and the first of many head pump overhauls was begun.

It really wasn't that bad and we learned something. We really could do this stuff if we just put our minds to it.

Somebody once said that cruising was going from one pump repair to the next. That certainly used to be true, but we've found in the last decade that our pumps have gotten much more reliable.

Repair Rules

There are several basic rules we've learned, which apply to all repair jobs. The first is: Don't be afraid to tackle the project. On innumerable occasions we've put off repairing a piece of gear, much to the discomfort of those on board, because we weren't sure we could do the job. But then, when finally forced to take action, we've found that the projects have almost always been simpler than we feared and have (usually) turned out well.

Take, for example, the faulty DC alternator that cropped up in Bali just before crossing the Indian Ocean. Dealing with the Balinese was difficult because of language differences. The alternator, one of two belted to the main engine, wasn't putting out, and we didn't want to sail 5,000 miles with just one unit working. We pulled the alternator off the engine and took it over to a neighboring yacht. We unscrewed the back end and pulled out the armature. It looked all right, as did the brushes. The diodes checked out, too. We finally found that one of the wires in the field winding had come loose. It was easy to repair, and an hour later we had both alternators functional. We had put that repair off for six weeks, fearing the job.

Look for the Simple Answer

The second axiom is: Always look for a simple answer to a problem. Consider the situation we found aboard the Deerfoot 72 *Locura*. We'd spent four hours and several high-seas phone calls trying to find the cause of the watermaker's failure to operate.

The motor begins to turn, but the generator cycles and voltage drops, and the circuit breaker kicks out. At first we fear a faulty high-pressure pump. The unit is disassembled and the pump appears to be okay. Well then, it must be the motor or its windings, even though this is a new unit. But an inspection of motor, capacitor, and magnetic starters reveals nothing. We then try to start the system with the high pressure hose disconnected from the reverse osmosis membrane. No luck.

Fearing the worst (short showers, no fresh water to wipe down brightwork, all salt-water dishwashing), we give up. Thinking about the voltage drop problem later, we decide to check the V-belt tension on the AC generator belted to the main engine. Guess what? It's loose! When the watermaker starts and pump pressure builds, the AC cruise generator starts to load up and the belts slip! Five minutes of adjustment on the belt and we have fresh water again.

Take Your Time

The third rule is: Take your time. Study the problem carefully. Look at the various potential answers and eliminate them one by one. Refer to your owner's and service manuals. Be as systematic as possible. And above all, don't become frustrated and angry. It's always helpful to remember (although sometimes difficult) that your boat in general and the offending gear in particular, bear you no personal ill will.

When to Start Disassembly

Fourth: Only start to disassemble something after all other avenues have been exhausted. And then do it slowly, noting in writing the order in which things come apart. Label pieces clearly for future reassembly. Work over a surface that will contain anything you drop (avoid working over the bilge if possible). Be especially careful of springs. They tend to pop out rather quickly when tension is released, usually with disastrous consequences. After cleaning the disassembled pieces, carefully store them where they won't become lost or mixed with other gear. (Ziploc bags are great for storage.)

Use Judicious Force

Fifth: Be very careful about forcing something that's stuck. Chances are there's a better approach than brute strength for freeing it. We've caused ourselves immeasurable grief by getting impatient, using too much force, and damaging what we're working on.

What to Learn

The majority of cruising repairs revolve around electrical problems. To solve these mysteries it's important to have an understanding of the basics of DC and AC current (both easy to learn). In addition, learn how to operate a voltmeter.

Electrics

When a piece of electrical gear fails, the odds are there's a loose, wet, or dirty connection preventing the flow of electricity. Always check first that you have current at your equipment. You'll need to know how to replace brushes on motors and how to check diodes for proper current flow. The electrical system depends upon an engine-driven alternator to charge the batteries. This is a simple device with only three possibilities for failure. You should understand how to check the regulator, diodes, and basic internal wiring.

Pumps

For some reason, pumps seem to be more maintenance-prone than any other type of gear aboard. Water pumps head the list. Know how to check the pressure switch, determine if prime is lost, repair or replace valves, and check for leaks on the suction side of the system.

Bilge pumps don't like dirt. Know how to check for it and to clean the valves. Float switches on pumps are most unreliable. If the pump fails to turn on during high water, the float switch is usually the cause.

Engine and generator cooling pumps have rubber impellers which are subject to damage. If cooling water fails to flow, this is the first place to look—after checking your seawater strainer.

Diesels

Diesel engines rarely require other than routine maintenance, and when they do, the problems are usually related to fuel. Regularly check fuel filters and the tank sump. If you lose the prime between engine and tank, you'll have to understand the simple bleeding procedures required to restore the fuel supply. Beyond fuel, the various accessories will at some time give problems. The most serious of these will be the starter. You should be able to jump around the solenoid and change starter brushes.

The cooling system on the engine is a simple affair. Overheating can be due to a faulty thermostat, clogged heat exchanger, low coolant level (in checking for leaks, remember the freeze plugs), or lack of saltwater flow.

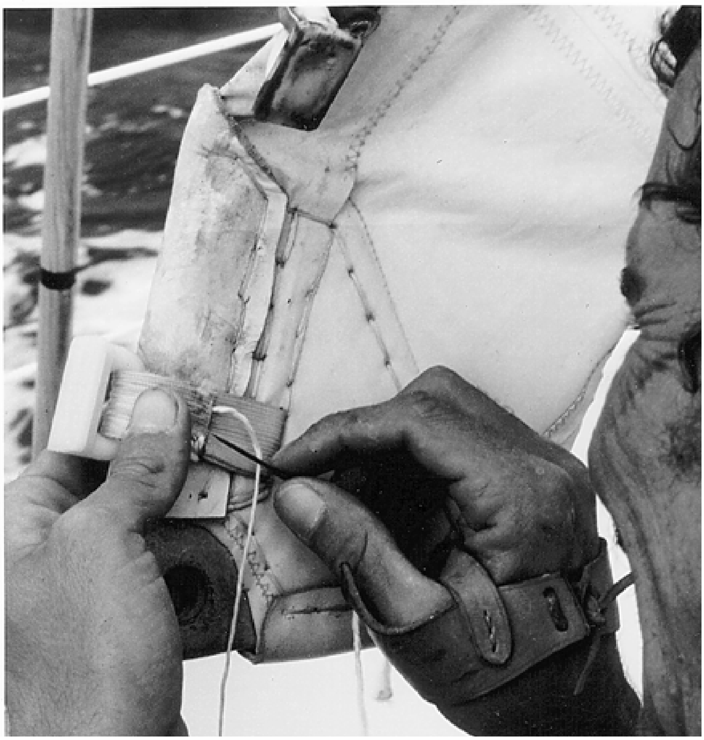
Refrigeration

The basics of refrigeration are very simple. And once you understand the basics, maintenance and repair become very straightforward. Know how to use refrigeration gauges, how to pump down and evacuate a system, and how to change the filter/drier.

You will also want to be familiar with the compressor drive system and what controls it.

Fighting sail chafe is an ongoing project as the miles roll by. Here our daughter Sarah and her friend Sarah Siebert apply some new chafe patches to a couple of Sundeer's mainsail battens before sailing back to California from Hawaii.

Sail slides (below) are right alongside batten pockets for the area on sails which require the most care.



Finally, know how to maintain the heat exchanger and raw water cooling pumps.

Mast Tuning

Mast tuning is an art form which varies based on rig type and the sort of sailing you do. One type of tune may be best for coastal sailing and something else for offshore work.

The best bet is to get a professional rigger on the boat, or a sailmaker who is familiar with mast tuning, and have them show you the right and wrong way to tune your own rig.

Make detailed notes and take measurements of the settings of your turnbuckles.

Basic Sail Repair

Nowhere is the adage about "a stitch in time saves nine" more true than with your sails. Understand the basic sail repair stitches, how to use adhesives and double-sided tape, and what to do about corners which need reinforcing.

You will also want to be able to re-connect sail slides and/or jib hanks, repair batten pockets, and add new chafing gear patches.

Help

THE TOOL KIT

We can't leave the subject of maintenance without some discussion on the collection of tools one should have aboard.

A majority of the tools in a good kit rarely see action. Some may go for years without use. However, on the day that a specialized item is required, having it aboard can make the difference between a short pause in your cruising plans and a cancelled vacation.

This point was reinforced one fall aboard *Intermezzo II*. We were heading to Florida from a summer cruise in New England. Sailing south down the Chesapeake Bay we developed an autopilot problem. Checking the system out and consulting with the factory eventually led us to a faulty circlip or snap ring. The only way to remove the circlip was with snap ring pliers. It just so happened that eight years previously I had purchased a set of these and they had lain, unused, at the bottom of the tool box all those years. You can bet when they were finally required we were glad to have them aboard.

The local mechanic's "workshop" in Turtle Bay, Mexico in 1990. As bad as this looks, if you have the right tools and parts aboard, the fellow who runs this business can probably get you fixed up enough to make it back to the States, or down to Magdalena Bay where there are better "services" available.

We break the tool list down into three categories. Daysailers and simple auxiliaries, used for short periods close to home, can get by with minimal kits, especially if the engine operation is not critical to the success of your voyage. Larger yachts, with a complete range of gear and dependence on their engines, generators, or windlasses, will need a more complete set, even when daysailing. If heading offshore or considering longer-ranged cruising, a complete kit prepared for as many eventualities as can be foreseen makes sense.

The biggest problem in deciding what is required in advance is visualizing the type of situation that may arise. Lack of access to equipment will be the biggest headache in many cases, creating a need for ingenuity. It's a good idea to explore various pieces of gear before they need service, trying to reach the nuts, bolts, or screws that may require turning in the future. Doing this in port will allow a few convenient trips to the hardware store to acquire the right combination of tools.

Among the most common problems that crop up when cruising are balky starter motors (can you get a socket on the bolts?), fuel injectors, bleed screws on injector pumps, and fuel filters. A large socket that fits the front end of the crank shaft for turning the engine manually or changing the crankshaft seal may be required. Check access to all hoseclamps. Frequently, special offset screwdrivers or 1/4-inch drive sockets with angled drives may be required on some clamps. How about your seacocks? Do you have room to work on them or is a special angled wrench necessary for service? The water pump impeller on the engine may have to be changed. Can you reach the face plate and extract the old impeller? A wrench large enough to adjust the shaft packing nut, and a packing picker to remove old packing should be aboard. Wrenches and special pliers may be required to service your steering cables. Taking care of balky heads may need special screwdrivers or wrenches to remove the head and get it where you have good access. When the time comes to tighten the V-belts on the engine, what will you use for a lever?

Basic Kit

For a basic tool kit you should have aboard a set of screwdrivers, two Crescent wrenches, a medium size set of Vise grips, needlenose pliers, a set of waterpump pliers, a Surform file, and set of wirecutters for use on rigging in the event of a dismasting.

Intermediate Kit

The next step up would add a set of open-end wrenches, 1/4-inch and 1/2-inch drive socket set (with socket extensions, ratchet drive, and breaker bar), feeler gauges, Allen wrench set, side-cutting pliers, regular pliers, a large Crescent wrench, a pipe wrench, a set of files, a wire stripping and crimping tool, soldering iron (12-volt if you don't have 110-volt), electric drill (we now carry a cordless along with our regular 3/8-inch AC-powered unit), hand drill, small set of drill bits, claw hammer, multi-meter (for testing electrical circuits), scissors, hacksaw, assortment of 18-, 24-, and 32-tooth hacksaw blades, grease gun, and oil can.

Complete Kit

Finally, for a complete kit, it's good to add box wrenches, a mirror with extension handle, a magnetic probe (for picking up lost bits), large to extremely small (jeweler's) screwdrivers, torque wrench, angle drives for ratchet set, propane torch set (be sure to store the propane cylinders in a sealed vented overboard locker), vise, full set of drill bits (up to 1/2-inch), set of easy-outs, tap-and-die-sets, 1/8-inch through 1/2-inch pipe taps, prop puller, wheel puller, (for pulleys, small bearings), ball peen hammer, rubber mallet, four-pound sledge hammer, two-ton hydraulic jack, snap ring pliers, large Vise grips, second pipe wrench, set of punches and cold chisels, set of wood chisels, crow bar, small wheel puller for changing alternator pulleys or steering wheels, impact wrench set, Stanley utility knife, bronze drifts, grommet tools, tubing cutters and flaring tools, a chain wrench, and last, several "cheaters"—lengths of pipe that can be fit over other tools to extend leverage. A variety of rotary rasps for the drill are handy when you have to customize holes or create access in tight spaces. And while we're talking about drill accessories, compact drill motor stands, which allow the portable electric drill to be used like a miniature drill press, are marvelous.

With refrigeration aboard you'll want to add a halide leak detector, service wrench, and set of refrigeration gauges. If you have AC power aboard, via generator or inverter, you may want to carry a four-inch high-speed grinder. These grinders are useful in a variety of ways and will work wonders with wood, aluminum and steel. Since grinding and sanding wheels may be hard to come by, carry a good inventory.

Maintenance of your tools, especially those that rarely or never see use, is difficult in a salty environment. We oil our specialized tools, wrap them in soft rags, and stow them in plastic bags. Everyday tools are hung on a rack or stowed in a chest and sprayed regularly with a water-dispersing lubricant.

Special Tools

There are several special additions to the tool kit to consider. First are metric tools. Even though you may not require them, they can come in very handy. For example, a 12-millimeter metric wrench is slightly smaller than an SAE or US standard 1/2-inch. If you're having a difficult time breaking a 1/2-inch bolt free, and the corners are rounded, the metric may fit snugly enough to do the job. It may be necessary to tap the metric wrench on with a hammer, but once it's on you can be sure it will stay put. We like to carry metric sockets, open end and box wrenches, as well as Allen keys.

To assist in tight areas there are specially shaped wrenches and socket drives, with vertical and horizontal offsets. The same holds true for screwdrivers. A variety of shapes, blade widths, and lengths should be aboard. You'll also want an offset ratcheting screwdriver. Several sizes of screwdrivers should be aboard, with screw holders on the ends for holding nuts in awkward places and for starting bolts and screws in similar circumstances.

Welding and Brazing

Welding and brazing gear can be very handy equipment. Of course one has to be familiar with the basics of welding, but that skill is easy to come by. There are kits available that include oxygen and acetylene or propane in small, compact bottles. With this equipment one can braze refrigeration tubing, broken bronze fittings, and light steel.

Cruisers in aluminum yachts should consider carrying a compact, portable, MIG welding gun. With its control box and some welding wire the amount of storage space necessary is equal to a couple of sextant boxes. Any moderately heavy DC welding power source, usable with steel, will also make welding aluminum feasible, if you have this gear aboard. Wire-feed inert gas welding equipment is not difficult to use, and basic aluminum welding skills can be acquired in a few days of training.

Some form of a vise, portable or fixed, is essential for serious work. For years we made do with a small machinist's vise, but for serious work there's nothing like a proper, bolted-down vise.

Don't Sail on Fridays

It all started (as these things usually do) with a bad decision. We were anchored in Neah Bay, at the entrance to Puget Sound on Washington State's northwest corner, and ready to head south after summer in Alaska.

Having powered most of the summer the tightly spaced isobars of the Pacific high which were showing up on our weatherfax looked most inviting. There would be strong following winds!

Thursday afternoon: We've seen Neah Bay, marveled at the museum, and are itching to go. But leaving in the morning means a *Friday* departure, and not just any Friday. This is Friday the thirteenth!

Now we all know that such superstitions are ridiculous. Yet, over the years we've abstained from leaving on Fridays. Call it what you will, to us it is like heavy ground tackle and stout rigging; it just makes sense.

So here we are, ready to go, with a great high pressure system to ride, worried about it dissolving and having to power down the coast. Do we go with the weather or superstition?

"Gee whiz," I say to Linda. "This is almost the twenty-first century. Besides, it will warm up once we get away from the coast and really into the high. And *Sundeer* seems to be a different type of boat when it comes to weather, and maybe this applies to leaving on Fridays."

The ride we have for the first 400 miles is spectacular. A strong quartering to running breeze, gusting into the high thirties, short steep seas which give *Sundeer* some of the longest and best rides of her career, with warm days and moderate nights. And we cover that first 400 miles in a little under 37 hours.

For one short period, just south of the Columbia River of the Oregon coast the wind drops into the low teens. Even though we are well offshore the steepness and size of the swells is impressive. A couple of them actually smack our transom, a first in almost 30,000 miles for *Sundeer*.

The following morning, 0400 hours, and we are approaching Point Saint George just north of California's Crescent City. It is the end of my watch, and I am thinking about our potential sub-three day passage down the 1050 mile coast line. As if he has just read my mind Aeolus turns off his wind machine. So much for a record passage.

I turn the ignition key and nothing happens. Assuming a loose wire may be the culprit I go down into the engine room to have a look. Tapping the engine room starter button I hear the starter engage but it is obvious the engine will not turn over.

Water in the Engine

I sit there, looking at the nice clean Isuzu diesel, refusing to think the impossible. If the starter turns, and the engine makes that funny clunk sound there can only be one reason. Water in the combustion chambers.

Reaching across to the tool box I pick up a large screwdriver and begin to undo the exhaust line where it attaches to the engine exhaust manifold. As the hose clamp comes loose out with a whoosh rush several quarts of sea water.

Even though *Sundeer* has a high loop in the exhaust line, a large aqua lift, and an engine head which is two feet (60 centimeters) above the waterline, somehow water has climbed up and through these defenses.

When I announce the problem to Linda she just looks at me with the same expression she'd had the day I put us on the coralhead outside Port Louis in Mauritius. "Friday departure!" we say in unison.

Well, this is not the end of the world. It's just that I'm not ready at this point to get into the engine room with a left-over sea and little wind. But since I'm not sure how long that salt water has been sitting in the engine I figure I better get the fuel injectors out and the oil changed.

The injectors, which a month before had slipped easily out of the head, now refuse to budge. Anybody for a leaving on a Friday out there?

Okay, we're just 12 miles from Crescent City. This is the first harbor without a breaking bar to run since Neah Bay; on this score we're in luck. We are a sailboat, so, like in days of old, we'll sail in, anchor, and get some professional assistance.

But of course, a sailboat needs wind. And since the wind gods in this part of the world have reciprocal agreements with those to the north, and since there is a special treaty covering sailors dumb enough to depart on Fridays, it takes twelve hours, 16 tacks, and 21 jibes to cover the 12 miles.

But in the end we do get the anchor down, it holds nicely; and Linda and I vow to each other never, ever again, to depart on a Friday.

So here we are with salt water eating away at our engine, late on Sunday afternoon, with nary a soul in sight. We spy a trawler unloading its catch and ask the skipper for a recommendation on a diesel mechanic.

"Not much choice around here" he says. "We all use Larry Nelson."

If the commercial fisherman speak well of a mechanic, you know he is going to be good. "Perhaps we've paid our dues for leaving on Friday" I think to myself.

Monday morning, after a couple of minutes working with Larry, I know our luck has changed.

Larry Nelson comes in a large package, six foot two or three I'd guess and maybe 220 pounds. And while there's a lot of obvious power to use in that frame he has something essential in a good mechanic, a gentle touch. Throw in experience working on all sorts of engines in commercial and pleasure craft and you have the ideal mix to deal with our problem. It's not the water so much as getting the injectors out. They are a tight fit to begin with and if they don't come free with the engine head on, it means removing the entire top end of the engine.

The Mother of All Injector Battles

I won't bore you with the details of the many skirmishes in our mother of all injector battles. Suffice it to say, with Larry furnishing most of the brain and brawn, and your correspondent chipping in now and then to apply some wiggle pressure and the odd squirt of penetrating oil, four hours after starting the injectors were sitting on the work bench in *Sundeer*'s engine room.

While our removal techniques get better as we gain more experience the rest period between exertions becomes longer. This is tiring work, hunched over in varying degrees of discomfort, trying to apply controlled pressure to a series of ingenious levering arrangements.

During our rest periods I pick Larry's brain about the whole water removal process. Here's what I learn.

Time is of essence: From the point at which you begin to open up the engine, through this step you can't stop. Once the wet surfaces are exposed to air they start to rust, so you have to keep going until you get each cylinder oiled.

Keep an eye on battery voltage level. There's a lot of cranking to be done, and you need to have some juice left over for starting the engine when you're finished.

Possible Sources of Water in the Engine

Water can get into the engine from a variety of sources. Most common is what happened to us. A big sea boards you from astern and overcomes the obstacles that have been placed in its way (a "waterproof" system can only be accomplished with a valve, placed as close the hull exhaust as possible. Of course the valve must be closed to work!). It is possible with some engines to pump the sea water used for cooling into the pistons if the engine is cranked over for long periods without combustion (it's the combustion exhaust which forces the seawater out the injection elbow in the right direction. Or, if your engine is mounted below the waterline, and the backsiphoning valve gets clogged, water will flood into the exhaust line.

If the head gasket fails, freshwater from the cooling system will find its way into the cylinders (you will know this is the problem if the freshwater coolant tank is empty. Also, overheating can be a sign of head gasket failure.)

Pay attention to how your engine could flood and you'll be able to ignore what follows.

What to Do if the Engine Floods

Understand that water will not compress when the starter motor kicks over. If the batteries are really strong, and you hit the starter button for more than an instant, there is a good chance you will bend or break a rod (more about this later).

If the engine does become flooded time is of essence. The longer the water sits in your engine the more chance it has to stick things together and make a general mess of the innards.

If the engine is flooded while it is warm, time is even more critical. The engine's heat evaporates some of the water leaving salt deposits. You can't imagine anything worse for your engine.

In our case, with a cold engine, something between 24 and 36 hours had elapsed before I realized we had a problem. Unable to remove the injectors at that point another 24 hours went by the boards before I met Larry.

As soon as possible remove the injectors. Cover anything you want to keep dry as the water will be expelled with great force and make a mess out of everything. This means protecting electronics, pumps, the starter motor and alternator (we used garbage pail liners over critical gear). If the engine is inside your interior, watch out for fabrics.

Next, take an old towel, fold it over three or four times, and place it over the injector openings. This will block and absorb the water to a degree. Have someone hold the towel in place.

If you have a remote starter button, one which is mounted right by the engine, use it with quick taps; just a fraction of a revolution is all you want each time. Even though the injectors have been removed, if the cylinders are filled to the top with water, you can still damage the rods with too much force. Better yet, Larry cautions, turn the engine over by hand, using a socket wrench on the power take off stub.

Once the water is out, then hit the starter button four or five times for about 20 seconds each time. This helps dry the cylinders.

Stuck Injectors

If the injectors don't come out and you have glow plugs, the same procedure can be followed by removing them. However, in this case you *must* turn the engine by hand as there isn't enough space in the glow plug hole for the water to escape with the starter motor.

Okay. You've removed the injectors, the water is out of the pistons, now it's time to lubricate things. Take a small amount of oil (I offered Larry a choice of our 30-weight lube oil or transmission fluid, which is much lighter, and he chose the latter—but he says you can use almost anything) and drop it into each cylinder

Turn the engine over with the starter for 10 seconds.

This forces the oil into the cylinder walls, valves, and down alongside the rings.

Change the Oil

Some of the water has found its way past the rings and into the engine oil, and the next step is to drain the oil/water mixture from the engine. Make sure to get the very last drop out of the pan by pulling the sump plug at the bottom of the oil pan. If the engine has been operated with water in the oil, pull the filters, too.

Change the oil, run the engine for 10 to 15 minutes, and then repeat the process. With new oil and new filters run the engine for thirty minutes. Drain this oil, change the filters once again and except for a clean up, you're finished.

How do you tell if there is a bent rod? Larry says that if it is badly bent you will hear it knock. But it may only be slightly bent. If this is the case, you will only know by checking combustion. With the engine running loosen each injector fuel nut, one at a time. You will hear the engine go from a smooth to a rough idle as the cylinder is starved for fuel. If there is no change in sound (or smoothness) on one of the cylinders you have lack of combustion. If everything was okay before this probably means a bent rod. Running the engine this way for more than a few minutes will lead to even bigger problems (however, if you have a bad injector you'd get the same symptom. To double check the injector in question replace it with a spare. If you don't have a spare switch it with another injector.) If the problem is only a bad injector you can run until you can get them serviced. Do not run the engine with a bent rod!

Hamish and Kate Laird

(Below) "Pelagic moored at Petermann Island. If one is unable to get into shallow water because the ice is too thick one of the biggest dangers is from large bergs drifting in with the tide. An anchor here would have been useless as the berg would pluck it off the bottom or could even ground out on it or the chain. The four lines are led to anchors on shore consisting of snow stakes (2-inch by 2-inch/ 50-mm by 50-mm angle-iron pointed at one end and with a hole drilled in the top end to assist in retrieving it) driven in with a large sledgehammer and rock strops (either chain or galvanized wire made up into a loop). Or if the snow is very soft a'deadman' (a baulk of timber laid flat in a trench dug in the snow at right-angles to the direction of pull) works well. A good shovel is very handy."

The professionals we've introduced you to previously have all been enormously experienced. But for the most part, their sailing has taken place in the temperate or tropical regions. Mistakes in these areas can be costly, especially with large yachts, but the risk factors are certainly moderate.

That is not the case, however, where Kate and Hamish Laird choose to sail. Hamish has spent the better part of the last 14 years sailing in and around Tiera Del Fuego, Cape Horn, South Georgia and Tristan De Cunha Islands, and Antarctica, including 12 voyages to Antarctica. Kate has considerable time in temperate waters, and for the past few years has been crew for Hamish aboard *Pelagic* as they worked at the bottom of the globe.

In this part of the world mistakes which would be an embarrassment elsewhere can become life threatening, so their comments on the subject of seamanship, which follow, have more of an edge to them. The area in which they cruise notwithstanding, the approach they take is universal in application.

Let's start with a story which Kate wrote for the *Wall Street Journal*, discussing an interesting experience with anchoring.

Petermann Island, Antarctica

The 30-knot northeaster had been our ally for two days, but it dwindled after dinner. Milling icebergs began to move toward the inlet where we'd moored *Pelagic*, the expedition yacht my husband Hamish and I run in South American and the Antarctic Peninsula.

Help

A few inches of new snow muted the cawing penguin colony ashore while Hamish and I motored out in the dinghy. All we could hear was the slap of the swell against the ice as we lassoed the first berg with 150 feet (45 meters) of floating line, then nothing but the roar of the outboard as we tried to shift a block of ice the size of a pair of 18-wheelers (with who knows how much hiding below the surface).

Herding ice is a fairly normal part of sailing in Antarctica. All the ice I'd shifted on two previous visits was small enough to push with the dinghy, but I was skeptical we could move this monster. Hamish, who was on his tenth voyage, reassured me. Slowly, we saw a hint of progress as the iceberg moved against the tide and away from *Pelagic*.

Whenever someone asks Hamish to name the safest anchorage in Antarctica, he answers, "Six hundred miles away in South America." All the nearby anchorages had been choked with ice when we approached Petermann Island two days before. Ninety-one years earlier, when French explorer Jean-Baptiste Charcot sheltered here through the winter, he and his crew aboard the *Pourquoi Pas*? strung heavy iron chains across the narrow entrance, but icebergs like these simply snapped them.

Petermann Island itself is a mile long, with a big hill faced with ice cliffs that rose behind us. The inlet is about 50 feet (15 meters) wide, enough to back *Pelagic* in and center her with four lines tied to rocks ashore under the watchful eyes of rampart cohort of penguins.

We only had to keep the bergs at bay until slack tide, which we were certain would be in a couple of hours. Meanwhile, we attacked another one.

The third time, I had my head down, monitoring the line whipping out from the floor of the dinghy as we circled the iceberg to form the lasso. "Drop it! Dump it!" yelled Hamish.

"An unwelcome midnight visitor, such as this bergy bit, will not allow you to sleep! The noise as it bumps into the hull will have you on deck in seconds. This particular berg was dragged out into deeper water with the dinghy and set on its way. Capture the berg by circling it in a dinghy paying out a thick polypropylene line (which floats) then get as far ahead of the berg as you can and start to tow. The tow line should be set up on a bridle off the transom with a slip hitch so that you can abandon your tow if it starts to capsize. A 25-horsepower or more outboard engine is preferable."

Help

"Rock strops can be either made up from galvanized wire looped and held with cable clamps or chain with the ends shackled together. Having both on board allows you to make use of a wide variety of potential anchor points. In a pinch the end of the chain can be tied in a large knot and act as a stopper with the chain running through a crack in the rock. Ideally where the rope line runs over the rock there should be some chafe gear (reinforced hose is good). Floating line is easier to run out to shore behind a dinghy and can also easily be flipped over bergy bits that become trapped in it. Using sinking line such as nylon can mean that ice settles on it at low water (a pickaxe is handy in this case!)."

While I'd watched the rope, the berg had drifted considerably closer to two others. This one was almost as long as 54-foot (16-meter) *Pelagic*, twice as wide, and perhaps 10 feet (three meters) tall in the middle. The swell was magnified inside the triangle of ice, and cold air radiated off the walls. The dinghy sloshed up and down, and I couldn't see a way out.

Behind us, our route had closed off completely, with a foot or two remaining between bergs. The gap ahead looked too narrow. I grabbed for a handstrap as we raced for it anyway, dinghy pitching, and squeezed through with a hand's breath to spare on either side.

There are no commercial tide tables for the Antarctic Peninsula, but it was three days after the full moon, so we knew we would have a "spring" (extra-high) tide that night, and that the swell would give it an extra boost. But when would it change? We could see that permanent ice onshore was already awash, and when we'd left *Pelagic*, the depthsounder showed almost a meter more water than we'd noticed in the previous days.

We shifted another berg, then returned to our first one to give it a pull. After midnight, one of the six New Zealand climbers on board offered to take my place for some herding. I crawled back into my bunk, but didn't dare to take off my thermals. If the ice grounded out at the height of the spring tide, we might be trapped inside for a month or more. I left my foul weather trousers rolled down around my boots like a firefighter and hung my jacket on the door instead of in the wet locker.

I had a hazy hour's sleep, although I could still hear the dinghy's occasional roar. Then it came alongside and I heard the

Help

thump of Hamish's boots on the companionway. At the sound of *Pelagic's* pre-ignition alarm, I sat up and slid my feet into sea boots. By the time the diesel turned over, I had the trousers all the way up and the shoulder straps on.

One of the bergs had parked on top of our anchor: We'd have to abandon it and its 100 meters of chain. I'd read about "slipping" anchors—it's a favorite trick in Patrick O'Brian novels—but never had to do it before. Hamish secured the loose end of the chain to a rock before I kicked the working chain out of its brake on deck. Instantly, one of our most important pieces of safety gear snapped over the side and vanished. No bubbles, scarcely a splash.

But we didn't have time to linger. Hours after we had expected the tide to turn, it was still rising, with the added push from the swell, bringing the ice faster than we could shift it. At the rate the bergs were moving, we might have five minutes before the door shut completely. We heaved the four shorelines aboard and piled them untidily on deck. As soon as the water was clear, Hamish started for the gap, iceberg to starboard, rocky shore to port.

Pelagic's centerboard keel lifts on a five-to-one block and tackle and a truck winch such as you might see on the bumper of a Land Rover. I had the remote switch in hand and began to lift the keel as soon as I felt us hit bottom.

The iceberg continued to close the gap. The pressure of 30-ton *Pelagic* wasn't enough to make it pause. The truck winch wasn't lifting the keel fast enough, but Hamish didn't stop to let it catch up.

The keel slammed off the rock bottom, and hit again. The noise was horrific: seven tons of steel and lead colliding with rock. But the keel was built for this sort of abuse. It simply pivoted on its pin, presumably with less paint on the bottom than before.

The danger was the unstoppable ice to starboard. Would it close the gap before we made it through? Would it trap us against the shore? Was there enough depth where we were going?

The boat was crawling, but with each slam of the keel shuddering through the hull and the rig, it felt as though we were at full throttle. Then we went for a few seconds without a hit. One more quiet thump, then nothing. We were through. The depthsounder showed we were back in eight meters, then ten... fifteen...

We rolled the four shorelines onto their spools on deck and hoisted one of

(Below) "This is what happened to an 80-pound Manson anchor when a berg settled on it at low water. In a situation where there is a danger of this happening you are better off not using the anchor at all and relying on the shore lines which can easily be retrieved. In this particular case we had to abandon the anchor and all its chain in a hurry, only just having time to tie off the bitter end to a rock before a hasty exit. It took a month before the ice disappeared from the cove before we could retrieve the anchor, now a shadow of its former self. Having a couple of spare anchors on board, nylon anchor warps and a small amount of extra chain meant that we could carry on regardless, however."

Help

the two spare anchors into place on the bow. Back to normal. It was 2:30 in the morning; we'd missed the moment when the Antarctic "sunset" blended into "sunrise," and it was light enough to read on deck.

We motored away from Petermann toward another anchorage two hours away. Behind us, the ice was still moving in. By 5:00 a.m. we were snug in Stella Creek, not sure if it was time for breakfast or for bed. It proved to be another quiet day. We walked over the glacier, watched skuas fly acrobatics above us, and then everyone spent the afternoon near the diesel heater, reading, baking bread, and napping.

But at 2:30 a.m., the anchor watch came down to knock on our cabin. "Hamish? Kate?" she said, "Sorry to wake you, but there's a lot of ice coming in..."

Okay, we grant you the Hamishes cruise in extreme conditions and it is not likely that either ourselves or many of our readers will need to worry about herding ice. But the same watchfulness, the same awareness of surroundings which keeps the Hamish's and their clients safe in Antarctica will also keep you safe in more benign tropical anchorages.

Let's switch gears now and hear what Kate and Hamish have to say on the subject of seamanship.

The Meaning of Seamanship

Good seamanship usually comes down to two things: prudence and preparation. While most of our sailing has been in the Southern Ocean—where we can count on having 50-knot winds nearly every week, whether we're at sea or a anchor—we don't change much about our philosophy when sailing in gentler climes, where 50 knots is the storm of the decade and usually has a name.

Prudence is about knowing your boat and your capabilities, reefing early, and not accepting that a job is "probably good enough." Preparation depends very much on the cruising ground. In Maine, where there is Fed Ex overnight delivery, you need fewer spare parts than in Antarctica, where we carry enough to rebuild the engine almost entirely and to repair or replace every system on board.

Design Philosophy

Is the boat up to the job? Does it have the stability for the biggest waves you're likely to encounter? Is it fast enough? Our 28-foot (8.6-meter) "Great Dane" is good for the Gulf of Maine, handles superbly under sail alone and was comfortable hove to in a gale in the Bay of Fundy that dismasted two nearby vessels. We've heard of a man who sailed the same design around the Horn and to the Falklands, but we wouldn't do it. Sailing a 40-footer (12.3-meter) or smaller in the Southern Ocean means there are just too many waves with your name on them.

We're also thoroughly convinced by the safety and convenience of a lifting keel, although a centerboard does add to the complexity of the boat and cuts down tremendously on the interior space. However, in an expedition yacht cruising in vaguely

charted areas, it's worth it. The pivoting centerboard has saved us from severe damage time and again, usually from hitting uncharted rocks (a situation where a daggerboard-style lifting keel would be as likely to suffer damage as a fixed keel).

Any boat sailed two-handed should have a single-handed philosophy: you shouldn't have to wake up the other person or wait until a watch change to reef or navigate. Even if you regularly take crew or passengers who help sail the boat, it's safer not to *need* them.

Can your boat withstand hull damage without sinking? Will it sink if it is gutted by fire? (On *Pelagic*, the seacocks are set on galvanized steel standpipes at the waterline for this reason.) Will your boat come upright if you knockdown or capsize? Can you beat off a lee shore in a gale without resorting to the engine or water ballast, and with both running backstays on?

We also wouldn't design a boat without a scoop, not only for use as a dive platform, but also for MOB retrieval. Plus, its convenience is hard to beat for climbing in and out of the dinghy.

Going up the rig at sea: in a short-handed boat it pays to have mast steps all the way up but there is a price to pay for the weight and windage aloft so if you are more fully crewed a bo's'un's chair makes sense. (This is where good preparation really pays as you will reduce the likelihood of ever needing to go aloft on passage if you have carefully checked the rig and halyards in port.) Having messengers already in position will make all the difference if you ever need to change a halyard.

"Four reefs might look stupid on the floor of a sail loft back home but you sure appreciate them when you need them. Cold air is dense air and packs more of a punch than the same windspeed in warmer climates with the result that you will reef earlier for any given windspeed in colder weather."

Complexity

Keep it simple, but on the other hand, as Hamish likes to say, "Any fool can be uncomfortable." We're not purists, and we're

Help

very fond of the diesel engine, the autopilot, the inverter, the diesel heater and hot (salt-water) showers, but we believe one should be able to fix every system on board. Even when you're cruising in an area teeming with diesel mechanics, it's generally faster and easier if you can fix it yourself.

Preparation

Almost everything that can be called "good seamanship" can be traced directly back to prior preparation of yourself and your yacht. Ashore you have the time to study the options, observe others, and gather knowledge. Read up on seamanship, maintenance, and boat handling. Take courses in sea safety/survival, celestial navigation, first aid, and engine repair (often available for your particular engine model). Sail with other skippers when you have the chance. Consider taking an ASA or USCG licensing course in the US or the British Yachtmaster program (now available at some US sailing schools).

Think through potential problems before hand. Imagine losing the mast, rudder, main engine, etc. (not necessarily all at once!)—what would you do? Have the materials to jury rig at hand; try out your emergency tiller at sea before you need it. Remember, the sea will always find the weak link. Excellent materials for jury rigging include plywood, threaded stainless rod and nuts, enormous hose clamps, wooden wedges, a selection of Delrin and nylon sheet and block, contact cement, and lots of duct tape.

A good workshop with a sturdy bench and vise is crucial on an offshore boat. We keep our tools in good condition by leaving them soaking in diesel whenever we leave the boat laid up. We also maintain a tool list of all tools and their sizes needed for oft-repeated jobs (very handy when you're heading up the rig or under the hull), and the wrenches needed for bleeding the engine are daubed with paint so we can grab them in a hurry. (Some sailors double up on engine bleeding wrenches and keep the second set mounted on the engine box.)

You will find a good welder and machinist almost anywhere in the world, but it pays to carry your own supplies, including stainless, mild steel, and aluminum welding rod, and some stainless and aluminum plate. Metal stock can almost always be turned into the shape you want, but not if there's none available; 316 stainless, for example, is impossible to find in some parts of the world.

Buy all the charts, pilots, celestial tables that you could possibly need, including ports of refuge downwind from your expected cruising destination. Charts may be expensive but they're a lot less than a new boat, or even minor repairs.

Maintenance

Schedule routine maintenance and refits, and allow enough time to do these jobs. It's a lot easier to do it right onshore or at anchor than to do a job "good enough" and then re-do it while the boat is thrashing around at sea. A good test of your repair standard is to ask yourself, "Would I let a close family member take

this boat across an ocean without me?" Maintenance schedules can be daily, weekly, monthly, and annually. Keep a good log of the schedule and work done. Everything should have a service schedule; if you're methodical about maintenance, you spend far less time repairing things at sea.

Some things we do at the end of every year include: service the fuel injectors, ream out the heat exchangers, adjust the valves, thoroughly clean the fuel and water tanks, service the windlass, winches, blocks, generator, outboards and other jobs too numerous to mention.

As far as the engine goes, if you can ensure clean fuel, clean air, clean oil and good coolant flow, you've beaten 90-percent of potential problems. A day tank is a wonderful addition: it enables you to bleed the engine quickly using gravity, and in dodgy anchoring or entrance situations you can be more certain about your fuel supply and flow.

We pull the rig, centerboard, and propeller shaft every two or three years for a more thorough inspection. On the rig, this includes pulling *all* the pins and the mast base and checking for wear, pitting or cracks. Using Norseman-type end fittings on deck means the rigging can be inspected easily where the chance of corrosion is greatest.

"Williwaws (fierce katabatic winds found on the lee side of an island) can generate winds in excess of 80 knots momentarily. An anchor in this situation would not do much good, especially as swinging room is in short supply so that you can't get enough scope out and the seabed of volcanic ash in the caldera of Deception Island offers poor holding. With long shore lines tied off to rocks this is a safe, if uncomfortable, anchorage."

Pre-Passage

Have check lists. We inspect the rig from top to bottom, clean and dry the bilge (not only to prevent pumps clogging on lost socks but also to alert us on the appearance of any liquid be it

Help

seawater, fresh water, coolant, oil or diesel), resupply spare parts, provision, begin following the weather patterns and run through a safety briefing with new crewmembers.

Then we prepare for the first three days in case we feel seasick: take pills the day before if necessary, cook a few meals, pull out all the charts and piloting information for the passage, write the watch list, check harnesses and tethers, run jacklines, and even lay out the clothes we will need for the first few days.

At Sea

Now prudence becomes about keeping the odds in one's favor. Gather weather information from several sources, such as SSB weatherfax, real-time satellite photos, professional weather routers, and evaluate the data they are using to make their predictions. Off Cape Horn, for example, the Valparaiso weatherfax is very good, but it helps to know their analysis comes almost exclusively from cloud patterns—there are few local data reports from the west of the Horn. When using professional routers, be sure to give them enough lead time to familiarize themselves with your local situation.

No matter how good your forecasts are, watch your barometer, wind trends, swell direction and intensity, and the sky. Since all the crew may not be as savvy, it is often helpful for a skipper to leave written instructions describing specific criteria of concern, such as a change of wind speed or direction or rapid barometer changes.

Pay attention to the local currents, through published tables and chart notations. A wind against tide or current can turn a gale into an emergency.

If it looks as though the wind may head us during the passage, we work up to weather (or what will be "weather" after the shift) to put miles in the bank, just as though we were racing around the buoys.

Reef early, shake out late. Keep the crew warm, fed and rested in case something does go wrong. Go immediately into the watch pattern and sleep whenever you can—a bit of banked sleep can mean the difference between a dangerous situation and a merely annoying one if gear breaks or the weather requires hand steering.

Navigation

Practice using the radar in good visibility. In Antarctica it is particularly difficult to use because of the floating ice, so a consistent radar watch is helpful, including a formal handing-over between watches, so the new hand fully understands what is ice and what is land, and how it relates to the paper chart. Personally, we would never go to sea without paper charts, although the trend seems to be toward electronic images.

The fastest method for fixing position is to use the VRM to gauge distance off three distinctive points, then strike the arc on paper with a draftsman's compass to get a "cocked hat" fix. Radar watch alarms are a must for watching squalls, icebergs, or ship traffic.

Practical Seamanship

We realize that absorbing all this information can sometimes seem to be an overwhelming task. Certainly there are lots of things to remember, and a variety of conditions in which to apply what you have learned. However, the basics are really quite simple, and if you keep a few things in mind, the rest will become self-evident in due course.

What are these basics? First is to stay alert to the surroundings, and never take what you think you see as 100-percent accurate. If you assume the worst, and have an alternate plan of action in the back of your mind, you will go a long way towards avoiding problems.

Take weather, for example. We cannot emphasize strongly enough that what you see on the weatherfaxes or hear on the radio—even what professional routers tell you—has to be taken with a grain of salt. Keep your eyes open to the local conditions, and then act in accordance with what *you* determine is going on.

Second, always assume that any single piece of navigational gear may be wrong. Back the first fix up with a second. If the GPS or chart plotter shows one thing, and a mistake could put you in jeopardy, make sure you have a visual or radar fix to confirm position and charted accuracy. Plotting position on paper on a periodic basis, so you can see any anything abnormal in the vessel's progress, also helps.

Third, always keep in mind that in most situations you are safer offshore than trying to make an unfamiliar or difficult landfall in adverse conditions. Safety is almost always better with adequate sea room. If conditions are not good for a given landfall, consider waiting until they improve, or selecting an alternate destination. It is usually better to spend a few extra hours or days hove to offshore, than to risk the boat and crew when closing with shore.

Staying ahead on maintenance is another key ingredient to successful seamanship and pleasurable cruising. Most problems are easily repaired (or jury-rigged) if caught early. But small problems, left alone, often become much bigger problems. If these manifest in dirty weather or difficult navigational areas, the results can be disastrous.

Seamanship as an Art Form

We started out talking about seamanship as a form of art, and we'd like to close with some thoughts on this subject.

The more you handle your boat, and the more experience you gain in different situations under both sail and power, the better your skills will be. This applies to sail trim, taking the helm on occasion (as opposed to allowing the self steering gear to do all the work), and maneuvering in tight quarters. If you practice sailing into and out of progressively more difficult spots, you will rapidly find your skills and self-confidence growing.

Help

Larry Pardee

The two faces of cruising. Left, Moonhole on the island of Bequia in the West Indies. Bequia is one of those special places that make all the hassles of "getting there" worth it. The opposite extreme is shown on this page. While we do not want to dwell on the negative, the photo offers mute testimony to what can happen. Check the prop. This boat belonged to a crew that depended on the engine to save them—when they could no longer use it, they did not have the sailing skills to get out of trouble. Had they left the anchorage at the onset of weather, or cut their ground tackle and sailed clear, the boat would not have gotten into this predicament.

Pretty soon the challenges of turning your seamanship skills into an art form become a real pleasure, something which adds measurably to the enjoyment of time spent on the water.

And while you are building on your growing experience base, you are also making your boat and crew safer, should you find yourself in an adverse situation.

We are convinced that the time invested in learning and practicing seamanship will do more to make your cruising safe, comfortable, and enjoyable, than anything else you can do (or any money you can spend!).

Happy Cruising...

Help

Help

Help

Help

Help

Help

A Word about the Dashews' Books

Over the years Steve and Linda Dashew have been fortunate enough to work with sailors all over the world, while cruising, as well as in their yacht design and construction business. In the process of sailing more than 200,000 miles and building 50 large yachts they have encountered nearly every aspect of coastal and offshore sailing.

They draw upon these experiences in a series of books designed to help the reader cut the dock lines and go—in the fastest, safest, and most economical manner possible. Whether you dream of weekend sailing with summer vacations spent on the water, or living aboard and becoming a full-time cruiser, you will find this series of cruising tools the best investment in time and money that can be made.

The Dashews' books provide the foundation to make your cruising experience safe and enjoyable. Step by step, they guide you through everything from choosing the right boat for your specific needs, to deciding how to outfit the boat, to proper seamanship tactics in every conceivable situation.

Offshore Cruising Encyclopedia

Offshore Cruising Encyclopedia covers all aspects of yacht design, construction, and the cruising lifestyle. It starts with anchoring systems and goes right through interior décor, earning money while cruising—and even covers the schooling of children. *Offshore Cruising Encyclopedia* includes more than 2500 photos and drawings packed into 1232 pages. "This is surely the finest, most complete, authoritative, and above all, most human among guides to the serious side of ocean voyaging and local cruising." *Yachting*

To read sample chapters, the full Table of Contents, and more reviews online, **click here**.

Mariner's Weather Handbook

As every sailor knows, weather is the single most important factor affecting safety and comfort at sea as well as at anchor. That's why the Dashews have written *Mariner's Weather Handbook*. It covers all facets of weather forecasting and analysis, and will teach you how to use the Internet to access the latest marine data. You will learn the traditional techniques of making accurate forecasts solely by looking at the conditions surrounding your location. Most important, *Mariner's Weather Handbook* will help you read between the lines of official forecasts, to better understand what is likely to happen in your own patch of ocean. And once you are on a passage, its handy check lists will keep you up to speed. "Essential…for any sailor who has even the slightest interest in developing a good understanding of the weather." *Practical Sailor*

To read sample chapters, the full Table of Contents, and more reviews online, **click here**.

Surviving the Storm: Coastal and Offshore Tactics

The Dashews have always held a firm belief in planning for the unexpected. This is why they wrote *Surviving the Storm: Coastal and Offshore Tactics*. *Surviving the Storm* shows you how to prepare yourself, crew, and vessel for extreme weather. After you've armed yourself with the knowledge and tactics in this book, your definition of heavy weather will change, and moderate gales will become a chance to experiment and learn rather than something to be nervous about. *Surviving the Storm: Coastal and Offshore Tactics* teaches by example. It includes 70 in-depth interviews with professional and amateur sailors who discuss the tactics they used and the mistakes they made when facing the most extreme conditions imaginable. "The most sweeping manual on heavy weather I know." John Rousmaniere, author, *The Annapolis Book of Seamanship*

To read sample chapters, the full Table of Contents, and more reviews online, **click here**.

Practical Seamanship: Essential Skills for the Modern Sailor

The latest book in this series, *Practical Seamanship: Essential Skills for the Modern Sailor* is designed to help you build and improve your seamanship skills. Covering more than 930 topics with 800 detailed illustrations, this is the most detailed and thorough book ever written on the subject. From tropical cruising skills, to working in ice, to avoiding collisions, every subject of seamanship—from the most basic to the most advanced—are here to shorten your learning curve and make cruising even more enjoyable. "The Dashews' *Practical Seamanship* is a graduate course in going to sea." *Sailing*

Reviews and Comments

"Replete with literally dozens of clear, concise photos and illustrations, and chockful of first-hand stories from countless long-range voyagers, the Dashews' encyclopedic *Practical Seamanship* is a vast resource that'll be an important reference tool for sailors." Herb McCormick, Editor, *Cruising World*

"Comprehensive cruising advice...an absolute compendium of concise, definitive information for cruising sailors. The second edition, refined and updated from the first, contains so much information it defies a quick description. For thoroughness...the *Offshore Cruising Encyclopedia* is unparalleled. For those who cruise there is not another book on the market as comprehensive as this one." *Practical Sailor*

"I devoured both...*Surviving the Storm* and *Mariner's Weather Handbook*...enroute to the Seattle Safety at Sea Seminar. I found them to be the best books on these subjects I've ever seen, for the blue water sailing public." John Bonds, Safety at Sea Educator

"*Offshore Cruising Encyclopedia* has everything you'll ever need to know about offshore cruising from people who have been there. A true encyclopedia built on first-hand knowledge." *Motor Boating and Sailin*g

"Take it from someone whose favorite TV program is anything on The Weather Channel: Steve and Linda Dashew's *Mariner's Weather Handbook* is the real deal. This big, fully illustrated volume is well written, clear and concise, and eminently informative." *Cruising World*

"*Surviving the Storm* is a detailed look at passage-making in the filthiest weather—what to do, how to do it, what not to do—with some of the scariest photographs of nasty sea conditions you'll ever want to see and case histories that will keep you up at night." *Wooden Boat*

"*Offshore Cruising Encyclopedia* is a book of superlatives...it will likely replace four books in your library...obviously of great value for any owner who wants to upgrade any system." *Sailing Canada*

"*Mariner's Weather Handbook* is not just another book on meteorology. This is a book about sailing, risk analysis and weather tactics (and) how a sailor can translate this knowledge on board and act accordingly." *Zeilen*

"Take the unblemished frankness and candor of Adlard Coles in *Heavy Weather Sailing* and process it through the prolific, if exhaustive, writing machine that is Steve Dashew, and you're apt to end up with something along the lines of this valuable tome, *Surviving the Storm: Coastal and Offshore Tactics*. With a wealth of stark photographs, and illustrative diagrams, Dashew digests heavy weather from every possible angle—human, mechanical, and meteorological—annotating his treatment by citing countless case studies of real boats in really horrific conditions. No aspect of or item on a typical voyaging sailboat is left unanalyzed. Tactics and storm procedures are outlined. Renown professional skippers are interviewed and profiled. This has all the makings of an indispensable voyaging resource." *Bluewater Sailing*

"The Dashews' *Offshore Cruising Encyclopedia* is indispensable to the point where I keep one copy in my office and another on my boat." Robert Perry, yacht designer

"*Mariner's Weather Handbook* is an excellent reference...As an operational weather forecaster and ocean racing tactical navigator I must say that it would be a BIG task to better your book." Kenn Batt, NSW Severe Weather Section, Bureau of Meteorology, Australia

"Just once through *Mariner's Weather Handbook* will suggest a new way of looking at weather. Repeated return visits as puzzling or threatening weather is observed will confirm and amplify its value." Knowles L. Pittman, Circumnavigator and Publisher of *One Design Yachtsman*

"If you are equipping, buying, or building a boat the Dashews' *Offshore Cruising Encyclopedia* will prove invaluable. Every serious sailor ought to have this book." Chuck Paine, yacht designer

For more information or to order any of these books online, **click here**.