Flying and Training in Alaska
to Become the Best Pilot You Can Be

Bush Pilot Way

William A. (Bill) Quirk, III

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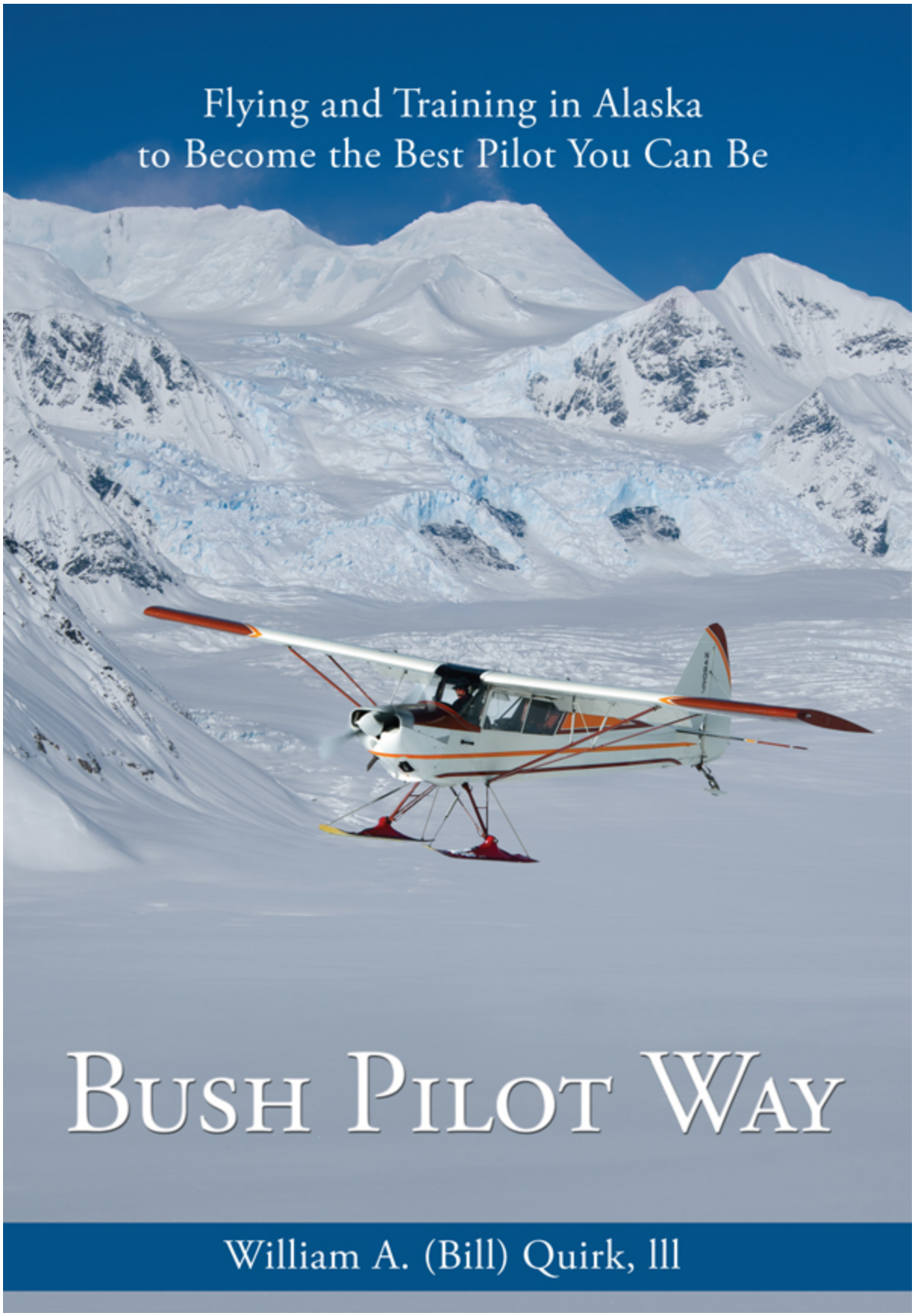

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Front Cover: The author coming in for a ski landing in the Ruth Amphitheater. Photo by Daryl Pederson.

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Dedication

This book is dedicated to the bush pilots of Alaska who have provided a captivating influence in helping fledgling aviators become the best pilots they can be.

Contents

Part I: Aviation Book

Acknowledgements

I must first honor Chuck Keim, professor in the University of Alaska's Department of Journalism and former dean of the College of Arts and Letters. Although my academic career is in the biological sciences, I veered off track and enrolled in Chuck's introductory college course in writing short articles. This was when I was in residence at the university in Fairbanks, Alaska in the early 1970s. Chuck was such an influential teacher that most of his students would go away from that experience knowing that they were capable of writing meaningful narratives. Of course there is no substitute from being a prolific writer to improve your journalistic talents. We were all required to write a short piece to turn in at the end of the semester. I wrote on hunting Mearns quail in Arizona with my clever and multi-talented Weimaraner (Gray Ghost) that could wind, trail, point, and retrieve the birds. I have also benefited in improving my writing skills by being a voracious reader ever since my high school days.

Bill Diehl is a long time aviator that has made significant contributions to aviation in Alaska. Bill recognized the Interstate S-1B1 airplane manufactured by the Interstate Manufacturing Company based in El Segundo, California for its dependable flying characteristics and its durable construction. He believed that it would make a useful bush plane for Alaska. Bill purchased the Type Certificate and tooling from Interstate in the late 1960s and created the Arctic Aircraft Company in Anchorage, Alaska. Arctic Aircraft transformed the Interstate S-1B1 into a bush plane by upgrading structural elements of the fuselage, landing gear, and wings. The redesigned aircraft was designated the Interstate S-1B2 and has come to be known as the Arctic Tern. A Type Certificate for the Arctic Tern was issued by FAA in 1975. Bill produced 31 Arctic Terns in his factory near Anchorage International Airport between 1975 and 1985. Ten additional Arctic Terns were built in the factory by converting Interstate S-1B1s to Terns. Bill also designed and built 4-place Arctic Terns called Privateers. He has built four Privateers.

I am very fortunate to have Marthy Johnson for copy editing the text for the book and Evan Swensen of Publication Consultants for his valuable assistance in preparing the book for publication.

There was nothing that prepared me for the consequences of meeting so many pilots in Alaska. The camaraderie has been fulfilling and it has helped me create a highly inspired learning and flying experience in Alaska. Below is a list of the pilots I have met along my aviation journey in Alaska.

Glen Alsworth, Bret Andersen, Tyler Andrews, Walt Audi, Jim Bailey, Jay Balwin, Thomas Beckman, Gary Bishop, Paul Boots, Bob Breeden, Bill Brown, Glen Burkheimer, Wally Butts, David Calkins, Terry Cartee, Dan Case, Scott Christy, John Claus, Paul Claus, Sam Cole, Bert Crowley, Dick Davidson, Ray Davis, Sean Davis, Tony Dawson, Phil Dean, Dee Deoudes, Eugene Desjarlais, Bill Diehl, Michael Dolan, Vicki Dombe, Darlene Dubay, Jeff Duft, Greg Endsley, Mark Faires, Winthrop Faulkner, Ron Fullerton, Jeff Garness, Damon German, Lars Gleitsmann, Charles Goentzel, Peter Goldberg, Andrew Granger, Bill Granger, Rick Grant, Lee Griffin, Robert Haggerty, Bill Hamm, Chet Harris, Dorothy Harris, Steve Harvey, Gary Hofstrand, Terry Holliday, Dan Hollingsworth, Herb Hubbard, Cliff Hudson, Jay Hudson, Oren Hudson, Ray Huot, Zachary Johnson, Wolfgang Junge, Larry Kaniut, Jo Ann Keller, Matthew Keller, David Krall, Tim LaPorte, Paul Larson, Dr. Scott Laudon, Tom Laughead, Dr. Finn Lunoe, Dr. Leif Lunoe, Clinton MacArthur, Dave Machado, Bob Magnuson, Dr. Michael McNamara, Mike Meekin, Joe Mets, Alfred Meyer, Kris Ogonoski, Joe Pazsint, Perry Pearce, Kellie Peirce, John Peterson, Richard Reiley, James Rood, Bill Roth, Heidi Ruess, Danny A. Sanchez, John Schoen, Ed Sharpe, David Slenkamp, Alex Stanionis, Calvin Stephens, Dick Sutliff, Robin Sylvester, Sean Sylvester, John Thorsness, John Toenes, Randy Tyler, Charles Vandergaw, Robert Vanderpool, Art Warbelow, Charlie Warbelow, Ron Warbelow, Dave Wartinbee, Billy Weidekehr, Adam White, David Wilks, Kenneth Wolter, Paul Woodward, Eric Yould, Patricia Yould, Mike Zaidlicz and Doug Zweifel.

Warning and Disclaimer

This book provides basic knowledge on flying techniques that bush pilots use in their conventional operations in Alaska. Please note that serious injury or death may occur from attempting to duplicate any of the techniques described in this book. This especially applies to pilots without the proper experience, skill levels, judgment, and common sense. Do not attempt any of the book's techniques without weighing the risks to you, your passengers, and your airplane. The author and the publishers of this book are not responsible for any reader's negligence, ignorance, or downright stupidity.

The basic theme in this book is self-training. If any techniques discussed in this book are attempted, it becomes the sole responsibility of the pilot to make the decision to proceed with the undertaking. You will be proceeding on your own terms, on your own risk, and with your own assurance that you can perform the task at hand. None of the decisions to train in your aircraft are implied in the book.

Preface

Why learn to fly the Alaskan Bush Pilot Way? It is the most potent pilot training or for that matter for any learning or training program possible. The Federal Aviation Administration and many others have uncertainties about the training. The training may be open to interpretation, speculation, and condemnation. However, I have found a world-acclaimed educational professor by the name of Sir Ken Robinson who has substantiated the effectiveness of self-training which is the bush pilot's way of training. The authors of *Super Brain*, Deepak Chopra, M.D. and Rudolph E. Tanzi, Ph.D., Harvard Medical School have also shown through a person's increased self-awareness and conscious intention, the brain can be taught to reach far beyond its present limitations.

The most important consideration about training the bush pilot way is to fully understand how the training is conducted. What I mean by this is that "self-training" is the modus operandi used in bush pilot training. Everything you do as a pilot in your training program is based on this important concept. Read about and discuss flying with other pilots as much as possible; however, in the end, you must take command and develop your own training program. You as the pilot in command will need to fly your own training sessions. You will develop into the best pilot you can be by learning on your own.

The training techniques displayed in the book are not provided for pilots to copy or to intentionally follow without conscious thought. They are provided so that pilots will have a basic understanding how pilots conduct their training. The information should be used for learning purposes. It will provide familiarity for the subject. From this understanding, a pilot can reach out and begin to create his own training program. In each and every facet of training, the pilot in command must take charge and develop his own program.

Introduction

This book was written to help young aviators in becoming proficient and self-reliant pilots by providing them with a comprehensive understanding of the proper type of training that is necessary. The book shows aviators precisely what is required from the beginning for them to reach their goal of becoming the best pilot they can be. The book also covers the high aircraft accident rate in Alaska and provides logical conclusions and practical ways to reduce the problem.

The book shows my aviation journey in Alaska which includes the camaraderie and training, the inspiration of flying Alaska's wild backcountry, flying wildlife surveys, and monitoring Alaska's rare and unique wildlife encounters while airborne. Winter operations including flying and landing ski-equipped aircraft are highlighted in the book.

Thirty-two color images are provided as a compendium in the mid-section of the book to fully display Alaska's incomparable flying environment.

The last part of the book contains 54 brief narratives covering general aviation topics and flying trips in Alaska's remote and scenic backcountry. The narratives provide detailed explanations of the joy of flying Alaska.

Part I: Aviation Book

The Beginning

I was born in America and lived in a very small town in the Deep South as a young boy. Later on, my family moved out into the country on a small cattle ranch. Early in my life, at the age of 12 or 13, I would hear an airplane and run out of the house to observe the airplane flying by. A few crop dusters and several general aviation aircraft occasionally flew near my country home. It excited me and I often thought that it would be the greatest pleasure to fly in an airplane looking out from far above the earth and watching the pilot. I never thought that I could ever be a pilot. A few years later, I was brave enough to ask a helicopter pilot, who had just landed, if he would take me up for a ride. He said he could do that. I was unbelievably surprised and could not wait for the flight. The pilot said he would show me the autorotation that can be used when the engine quits. We took off and my first flight in an aircraft showed me the sky and the earth and it really amazed me. I was not a bit scared, as I knew the pilot was in control and knew how to safely fly the helicopter. We went up to perhaps a thousand feet and the pilot told me he would chop the power, let the engine idle, and get the chopper blades to autorotate to slow down the descent rate so the helicopter would slowly float towards the earth. As soon as the power was cut back, the helicopter began to fall very quickly towards the earth. I could see that the pilot was struggling trying to get the helicopter to autorotate. The chopper would not autorotate and we were falling toward the ground at an accelerated rate. I was not afraid for I knew the pilot would do something fast to stop this free fall. He opened the throttle, the propellers began to accelerate, and the helicopter slowly stopped the rapid fall from the sky. The pilot then told me autorotation sometimes does not work. This was one time it didn’t work. I was not terrified by this experience at all. We flew around close to the ground and I really enjoyed the sight from above the earth. We landed and I thanked the pilot for taking me on my first aircraft flight.

I grew up in a family of four children— one brother and two sisters. Every few years many of our large clan of relatives had a gathering for the

Thanksgiving or Christmas holidays. I played with my cousins and almost never was involved in conversations with the adults. Nevertheless, on one occasion during these gatherings, I was asked what I want to be when I grow up. I blurted out,“I want to be an airplane pilot”. One of my adult relatives spoke up and said, “Only rich doctors’ sons fly airplanes and most of them get killed in crashes in a few years.” Everyone was nodding in agreement. I was stunned at the reply. I said nothing and quietly escaped from the gathering as soon as I could slip away. After this wet blanket of becoming a pilot, I never discussed my desire to become a pilot again with adults. I knew that there was an airport outside the small town where I attended high school. The airport was not along the main road and I made no attempt at asking others to take me there. I don’t remember ever arriving at this airport.

When I was still in high school, my parents bought me an airline ticket to fly from Southcentral Louisiana near my home to Houston, Texas. This was my first airline flight and the only airplane used on this route was the Douglas DC-3. I was very excited that I would be making my first airline flight. The round trip to Houston and return was everything I could imagine and even more, a fantastic experience loaded with excitement. I was really impressed with the power of those big 1,100-horsepower twin engines and the cruise speed of 207 miles per hour. That made a lasting impression on the young man that loved airplanes.

When I enrolled at Louisiana State University (LSU) in Baton Rouge to begin my college education, I did not forget about aviation. I checked out the Air Force Reserved Officers’ Training Corps (ROTC), which is a college-based program for training commissioned officers for the United States armed forces. I thought that this might open up an opportunity for me to become a pilot in the air force. I completed the first two years of ROTC and then was required to take and pass comprehensive and physical examinations if I wanted to enter advanced ROTC (the last two years) and become an air force officer and a pilot. I took the written exams and the physicals and passed them with flying colors. I was given 10 days to decide whether I wanted to sign up for advanced ROTC. I can hardly believe that I already knew at such an early age that I would never be satisfied with being a pilot in the air force because the training was “flying by the book.” There was no room to use your own ability, be innovative, and be your own pilot. That was not the kind of pilot I wanted to be, so I rejected the offer of

signing up for the air force advanced ROTC Program. I continued my education at LSU and received bachelor and master's degrees in agronomy and soil science.

After my college work at LSU, I enrolled at the University of Arizona in Tucson to continue my education and to do basic micronutrient research in citrus orchards in Yuma, Arizona. College duties take all of one's time and there is little left for other pursuits. Nevertheless, I did find time one afternoon to visit the Aerospace Maintenance and Regeneration Center (AMARC) on 2,600 acres adjacent to Davis-Monthan Air Force Base in the southeastern part of Tucson. AMARC is often referred to as the "Bone Yard" and it is a joint service facility managed by the U.S. Air Force Material Command as the sole repository of out-of-service aircraft from all branches of the U S Government. The Bone Yard opened after World War II and the first airplanes to be "mothballed" and stored here were the B-29s and the C-47s. Currently, over 4,400 aircraft and 40 aerospace vehicles are stored here. The aircraft can be stored here naturally (in open air) for cannibalization or reuse. Tucson was chosen because of its climate (low humidity, infrequent rainfall, and alkaline soil). This results in reducing rust and corrosion. The alkaline soil makes it possible to move aircraft around and park them without having to pave the storage areas. Many of the stored aircraft can be returned to an operational status in a short period of time. Eventually, a large number of the airplanes stored here are destined for being smelted down into ingots by nearby metal purchasers. In the early 1990s, under the Strategic Arms Reduction Treaty (START) with Russia, the Center eliminated 352 B-52 Stratofortresses. When the airplanes are brought in, the guns are removed, fuel and oil are drained, and the aircraft are sealed from the dust, sunlight, and high temperatures with high-tech vinyl plastic coverings.

AMARC is a controlled-access site with a high fence surrounding the property. Access is a bus tour which is conducted by Pima Air and Space Museum. It is impressive to see the way the large numbers of airplanes are positioned; some in rows and others in certain unique patterns, where the airplanes are closely packed. Airplanes included many military aircraft such as the jet fighter, bomber, cargo, helicopter, and others. One of my favorites was the B-52 Stratofortress. There must be very few left since the 1990s' removal under the START agreement with the Russians.

Establishing My Alaskan Aviation Roots

After my work in Arizona was completed, I was offered a position at the University of Alaska in Fairbanks to continue my education in natural resource management and ecology and begin research work on soil, plant, and water relations in the subarctic environment at the Poker-Caribou Creek Research Watershed northeast of Fairbanks, Alaska.

After college work was completed in Fairbanks, I found permanent employment with the U S Department of Defense managing the army's 1.7 million acres of land and natural resources in Alaska at Forts Richardson, Wainwright, and Greely. My office was on Fort Richardson, 7 miles northeast of downtown Anchorage, Alaska. On my time off from work, I often participated in Alaskan outdoor events including backpacking, mountain climbing, kayaking, rafting, fishing, and hunting in summer and in winter snow and ice climbing and cross country skiing. In August 1974 I made a solo Klepper kayak trip down the entire length of the Stony River (190 miles) from its head at Two Lakes (dropped off here by a floatplane) to 30 miles down the Kuskokwim River to Red Devil. Alaska is so huge that you must be efficient if you want to cover large parts of the Great Land. I paddled 12–14 hour days and averaged 50 river miles per day. This trip of 220 miles took only five days. Before the trip began, I called Robert Vanderpool at Red Devil and he agreed to fly me, my kayak, and camping gear back to Anchorage. Robert was the owner of an air taxi service on the Kuskokwim River. I pulled out of the Kuskokwim River at Red Devil and quickly disassembled the Klepper and packed it into two duffel bags. The camping gear went into a third bag. It was late afternoon on Wednesday and I was anxious to fly back to Anchorage that day if possible. I hauled my bags to the Cessna near Robert's house. Robert came out and told me that he could leave for Anchorage right away. I handed him my bags and he placed them in the Cessna for my return trip. Looking toward the river along the bluff I saw three small airplanes parked there. I asked Robert; "What are those airplanes parked over there used for?" He said, "Those airplanes belong to my children; they are in high school. I taught all of them

to fly and they often fly to McGrath (100 miles northeast of Red Devil) for a high school dance." All of the three airplanes were two-place tandem taildraggers. The best I can remember, the airplanes were probably two Pipers (PA-11 and J-3) and a Champion. I enjoyed the 250-mile flight back to Anchorage. Robert showed me several wrecked airplanes on the ground when we passed through Merrill Pass. Merrill is not a high elevation pass at just over 3,000 feet but it is a narrow opening in the Alaska Range and is a dangerous wind turret on extreme weather days.

The Klepper kayak river trip on the Stony and Kuskokwim Rivers was a great adventure in exploring remote Alaska. The Stony River had one tiny Native village on its 110 river miles from Two Lakes. Lime Village was an interesting Native village to visit as they still had a few families living in prehistoric earth dwellings dug into the ground. The population in 1974 was about 28; it has dwindled to only 11 in 2011. The settlement was established here due to the prolific fish found in nearby creeks and lakes.

Back at work, all I could think about was those Red Devil teenagers flying their own airplanes. This played out in my mind over and over. I had always been apprehensive about whether I could become a pilot. After this experience, all my doubts disappeared. I began thinking, "If those Red Devil youngsters can fly an airplane, taught by their father, there is no reason why becoming a pilot and flying an airplane will be a problem for me." This was the motivating force that I needed to become a pilot. By now it was September and winter was approaching. Our first snowstorms would occur in early October. I decided I would wait until the following June to begin my quest to become a pilot. I did start immediately looking for the best aircraft training facilities and reasonable costs.

In June 1975 I joined the Fort Richardson Flying Club (FRFC), which was located on Bryant Army Airfield 7 miles northeast of downtown Anchorage. The FRFC was a not-for-profit flying club managed by the US government. It was at the time one of the army's largest flying clubs. The club had a Federal Aviation Administration (FAA)-approved flight school with 18 instructors and 20 aircraft. Aircraft included several Cessna 150s and 172s, a Piper Cub and Cherokee, a Taylorcraft, a Beechcraft, a Cessna multiengine aircraft, and a Piper Super Cub on floats in summer and skis in winter.

The FRFC was not only convenient because my government office was only 1 mile away but it was one of the best flying clubs in Alaska.

Membership at the time stood at over 200 and the club was open to all military and Department of Defense civilians. The prices of monthly membership and aircraft rentals were also a bargain when compared to prices at Merrill Field in downtown Anchorage. The FRFC had its own building at Bryant Army Airfield. The airfield has one runway designated 16–34 with a 4,086-foot by 100-foot asphalt surface. The elevation of the airfield is 378 feet above sea level.

I began my flying career in Alaska on June 5, 1975. That was the day I took my first flight with an instructor in N17008, a FRFC Cessna 150. We were flying for 1.2 hours in the Cessna two-seat airplane. I had never been so excited in my entire life. I made eleven flights in June with an instructor, one in July, one in September, two in November and two in December. Working fulltime; often overtime hours, made it difficult to fly as often as desired. During the winter I did not fly as the preparation time of taking off the covers, preheating the airplane, and other chores took too much time. I resumed flying in April 1976 (two flights). Six flights were made in May and on May 16 I finally soloed in a Cessna 150. It had taken me almost a full year and 31.6 flying hours with an instructor to solo. Now I had more lead way and I could fly on my own. I took full advantage of this as I would go to the flying club and take off on a flying journey that was not the traditional training mission for a student pilot. I just loved to fly and I really did not like training very much. So my hours built up. I was not that motivated to hurry up and get the check ride and the private pilot certificate. I would just fly and worry about the check ride later. In 1977, I decided I must push to get my private license. I knew that my flying skills were much more than were needed to get the license. The big day came on June 5, 1977. I took my check flight for the private pilot rating and easily passed. It had taken me exactly two years and an accumulation of 122.7 hours in the FRFC Cessna trainers. I continued to fly the FRFC Cessna trainers (C150, C152) until August 8, 1981 at which time I had logged 317.3 hours as pilot in command.

After obtaining the private pilot license, I wanted to venture out and learn to fly other aircraft. The FRFC had many aircraft to choose from and I wanted to take advantage of this. My first new aircraft to fly was the Cessna 172. I made the check flight on January 10, 1978. This was a popular four-seat airplane and the FRFC had several of them. I continued to fly the FRFC's Cessna 172s until August 19, 1984. This was a flying span of seven

years. Total time as pilot in command in the Cessna 172s was 133.9 hours. My next airplane to learn to fly was the Piper Cherokee (PA-28-180). I enjoyed this aircraft very much; it was fast at 140 mph cruise speed and it could be landed in a strong crosswind with no problem at all if you kept the wing into the wind down until just before landing.

I was thinking about buying an airplane and I knew I wanted a taildragger, so I decided to get a tail-wheel endorsement at the FRFC. I looked at the popular Piper PA-18 Super Cub and the Taylorcraft F19. The T-craft was quite a bit cheaper to rent and so I went with it. As it turned out it was one of my better aviation decisions. I took my first lesson with an instructor in the T-craft in April 28, 1979. I will never forget; I could not even taxi this squirrelly airplane, much less make a good landing. The T-craft just wanted to swerve left and right and eventually end up in a grand ground loop. My instructor told me that the first procedure is learning how to properly use the rudder. This would keep this rambunctious little T-craft under control. Eventually, I learned how to tap the rudder pedals and keep this aircraft pointed straight ahead. I really enjoyed flying a taildragger. I eventually put 31.6 hours on N2000V, the FRFC's T-craft. I have never once had a problem after training in the T-craft with the tail starting to come around and cause the notorious ground loop. I credit this to the training in the T-craft. In addition, the low power (100 horsepower) of the T-craft provided better learning skills than a higher-powered engine such as a Piper Super Cub (PA-18-150) could provide.

Additional aircraft at the FRFC that I added to my flying list were a Beechcraft C23 Sundowner, a Piper PA-18 Super Cub, and a Citabria 7ECA. Other aircraft added to my list were my first privately owned airplane, my joyful Piper PA-11 in 1979 and my second privately owned aircraft in 1997, my trusty Arctic Tern. The FRFC served me well for 10 years, from June 5, 1975 to August 19, 1984. During this time span, I recorded 572 hours on the FRFC airplanes as pilot in command. Having the many great options with the FRFC provided me with a strong background for beginning an aviation career in Alaska. Unfortunately, shortly after I was no longer a member of the club it was shuttered. This happened due to several aircraft accidents occurring in a short time span. Paperwork had to be sent up the army chain of command. Orders came back from Washington, D.C. to close down the FRFC. This was a shock as this club

provided outstanding service to many Alaskans beginning a career in aviation.

I obtained my first privately owned aircraft on June 5, 1979 for a purchase price of $9,700 from Richard H. Reiley in Anchorage, Alaska. It was a Piper PA-11 “Cub Special” with serial number 11-1382. It was tied down at O’Malley Field in south Anchorage. The Piper PA-11 was produced from 1947 to 1949. The total number of airplanes built was 1,541. The current FAA registration shows that almost 550 of these Pipers are still in operation in 2012. Many of these Pipers are in Alaska. It was developed from the Piper J-3 Cub. The Cub Special formed the basis for the next evolution in the Piper Cub series—the most legendary Piper, the PA-18 Super Cub.

On June 7, 1979, my FRFC instructor gave me a check ride and signed me off as good to go with my new Piper Cub. As I began to fly the Piper, I also continued to fly aircraft from the FRFC. The time had finally come when I had my own airplane and I was very anxious to begin to learn how to fly the small Cub. My PA-11 had a gross weight of 1,220 pounds and an empty weight of 730 pounds. It had a left wing tank that holds 18 gallons of fuel and a right wing tank with a 13 gallon capacity. The 31 gallons with both tanks filled was sufficient for 5.8 flying hours (5.3 gallons of fuel per hour). The Piper’s engine was a Continental C 90-08. Later it was upgraded to a Continental O-200 which was 100 horsepower. Both engines were nonelectric which meant the Cub had to be hand cranked. That was never a problem after setting up a carefully thought out plan. My Cub was manufactured in the Ponca City, Oklahoma Piper Plant in 1947. The airplane was already 32 years old in 1979 when I purchased it.

By this time, I had lived in Alaska for 10 years and I had experienced a considerable amount of aviation familiarity with the bush pilots of Alaska. Most of my outdoor adventures in Alaska depended on bush pilots providing the transportation link for accessing remote areas. Many flights were in Southcentral and Southwestern Alaska although a few flights were in Southeast Alaska, Western Alaska, and Alaska’s North Slope. I had seen enough to know that I wanted to learn to train like the Alaskan bush pilots. How could any pilot in Alaska refuse to take advantage of this opportunity?

Alaska’s Flying Environment

The locale where pilots are flying is an important factor in pilot development. To evolve into the best pilot you can ever be, it is essential to have natural aviator talents and a passion for flying. These attributes are essential for further pilot progression. Often overlooked is an inspiring and motivating flying environment. Alaska offers among the best flying environments a pilot could ever hope for, especially in Southcentral Alaska when flying out of Anchorage. Having all three of these elements in your flying background will contribute to the highest possible level and sustainability of pilot development. The stimulation will propel your aviation career to new and higher levels. There will be no dull moments and boredom from flying in Southcentral Alaska.

What makes Southcentral Alaska’s flying environment so invigorating? Why it’s the sheer beauty of the sculpture (shape and form) of the magnificent mountains, glaciers, fjords, the wilderness character of the terrain, the spectacular wildlife to be found here, and the freedom experienced flying over an unpeopled land. All these unusual experiences are rare to find today in such a developed world. We are fortunate in Alaska that we still have these natural unspoiled frontiers.

Mountain ranges within an hour’s flying time in all directions from Anchorage offer a wide choice of landscape diversity. The Chugach Mountain range rises above Anchorage and continues eastward for 250 miles to Valdez, Cordova, and beyond. To the northeast of Anchorage are the Talkeetna Mountains with small glaciers near the highest mountain peaks, which are in the neighborhood of 8,000 feet. Northwest of Anchorage in the Alaska Range are Mount McKinley and the other gigantic mountains surrounded by massive glaciers up to 45 miles in length. To the west of Anchorage is the southern end of the Alaska Range with spectacular mountains and glaciers around perpetually snow-covered Mount Gerdine and Mount Spurr. To the south of Anchorage across Turnagain Arm of Cook Inlet is the fabled Kenai Peninsula. The Kenai is approximately 150 miles in length oriented northeast–southwest and from 50 to 100 miles in

width (6,425,320 acres). The beautiful snow-capped mountains rise from sea level to over 7,000 feet and surround the massive Harding and Sargent ice fields. The Kenai Peninsula replicates, in miniature, Alaska’s stunning landscapes. The inspiration from flying in these pristine mountains and glacier environments is off the charts. It will sustain your flying adventures forevermore.

Alaska’s Modern-Day Bush Pilots

The era of the traditional Alaskan bush pilot flying unreliable aircraft without radios across uncharted territory has ended. Nevertheless, modern-day pilots in Alaska are still flying into the bush. One of the most unique and rewarding experiences of living in Alaska is bush flying. Pilots regularly land tail-equipped aircraft (taildraggers) in remote, road-inaccessible or so-called bush areas in every part of the state. The landing apparatus on the small fixed-winged aircraft consists of wheels, skis, and floats to serve every season. There is no place where bush flying is as important and no place where it serves such a vital role in providing the transportation link as in Alaska. There is no place where the taildragger is revered more than by pilots flying in the Alaska Bush. And there is no place where the camaraderie of taildragger flying is more alive and well than in Alaska. All these features are what make bush flying in Alaska different from routine flying elsewhere.

The type of aircraft, the terrain that is flown over and the skill level of the pilot characterize the uniqueness of bush flying in Alaska. The taildragger is of historic importance as it was the originally manufactured aircraft in this country. The modern tricycle aircraft is now universally used throughout the world both in commercial and recreational aviation. The bush pilot is a throwback and flies a taildragger because it is the type of aircraft that is the most versatile under the broadest range of conditions in accessing the more remote and undeveloped areas. Bush pilots take off from airports such as Merrill Field in downtown Anchorage, Alaska but the next landing will be on remote lakes and rivers, gravel bars, sandy beaches, mudflats, grass-covered sod, tundra, glaciers, ice fields, and on the winter snowpack. Many landings are first-time events with no visually marked landing areas. The pilot selects the landing site from his/her aircraft and goes in and lands.

The terrain flown over is typically remote wilderness. Often the terrain is mountainous and capped with large glaciers and ice fields. Many of the river valleys are intensively forested. Coastal plains are often covered with

vast areas of wetlands. The Alaskan bush pilot not only flies over undeveloped country but mostly over unpopulated lands. There is no one out there to rely on for help or for anything else. Bush pilots are not deterred by this handicap but are energized by this rare type of freedom and independence that is almost impossible to find elsewhere in the modern world.

The skill level and training time necessary for a proficient bush pilot are substantial. It requires hundreds of hours practicing on off-airport locations to hone the skills that make competent bush pilots. Pilots who go through these exhaustive drills are richly rewarded for they are the most skilled pilots in knowing the finer nuances of their aircraft and being able to obtain the maximum flying performance under the most difficult conditions. They become masters of “edge-of-performance” flying skills that are required for safe flying operations in remote country. There are many pilots in Alaska with the highest skill level that is attainable for bush flying. These pilots are characterized as unusual, extraordinary, and unorthodox. They are far beyond the ordinary measure or limit of the instructor-trained pilot. They have amazing proficiency due to their many hours of flying time.

Flying taildraggers and being highly competent for off-airport landings in natural terrain is not about landing on backcountry airstrips. An Alaskan bush pilot would consider this no more difficult than a routine landing on the gravel strip at Merrill Field in downtown Anchorage. This is about a pilot having the capabilities of selecting short, challenging landing areas from the air and going in and landing on curving gravel bars, sloping ocean beaches, grassy tundra, mountain saddles and ridges, and other natural terrain areas. This is a “first-time” landing event where no one has previously landed. The skills needed to perform these difficult and challenging landings are marvelous to watch. It is close to unbelievable just how good an Alaskan bush pilot can be. You cannot overstate the incredible ability of the pilot to land and take off in such places. They can do it safely over and over again.

Taylor and Piper built nearly 40,000 production airplanes that qualify for the name Cub. Of these, approximately 10,000 are still on the U S Civil Register and Alaska has more than 3,000 of these taildraggers. Other taildraggers, for example, Cessna, Citabria, Champion, Scout, Aeronca, Taylorcraft, Stinson, Maule, Arctic Tern and others are popular and are regularly flown into the Alaska Bush. Merrill Field has 900 individually

owned airplanes (that's right, Merrill Field is not a commercial airport) with slightly over 50 percent of these being taildraggers. Anchorage International and Lake Hood airports have similar numbers of privately owned taildraggers as Merrill Field. The large number of taildraggers found in Anchorage and elsewhere in the State form the basis for Alaska being at the pinnacle of taildragger and bush flying in the entire world.

Bush pilots in Alaska may be private or commercial pilots. The commercial pilots work as outfitters for big game and fishing guides and air taxi operators hauling passengers and cargo to every remote part of the state. Pilots flying to the bush should not be unexpected with the widely scattered villages without road connection to the state highway system and the large number of tourists, hunters, and fishermen coming to Alaska. What is truly remarkable and unexpected is the amazing number of private pilots in Alaska that take up bush flying more as an avocation (hobby) than as a vocation (professional career). They purchase a taildragger, routinely fly out to a local gravel bar and hone their skills, and join the ranks of the Alaskan bush pilots. This speaks volumes as to how attractive, challenging, and enjoyable bush flying is in Alaska. Another unexpected and revealing feature is that many Alaskans who do not own aircraft are our greatest allies; they are familiar with and share a keen interest in bush flying in Alaska.

Alaska has some of the best flying weather. Although the mountains in Alaska reach high elevations, the valleys are usually low in elevation. The days are cool in summer and cold in winter. This makes for excellent flying weather with great lift in summer when day temperatures are in the 50s and 60s Fahrenheit. This contrasts with high temperatures (from 80 to over 100 degrees Fahrenheit) and miserable flying conditions (greatly reduced lift) in the Lower 48 states in the summer months. Density altitude is rarely a problem in Alaska; we can fly anytime without worrying about high density altitude conditions. Alaska can have very windy days, low ceilings (fog), and other serious flying weather problems that can be challenging. However, there is ample good weather and sufficient flying conditions for many days in Alaska in both summer and winter. The Alaska snowpack is sufficient for excellent ski flying during the winter months. The colder winter flying days (10 degrees Fahrenheit or lower) are the best. They not only provide better lift but the snow conditions are enhanced for landings. The hills with plateaus above tree line (higher than 3,000 feet) make

excellent landing places in winter due to powder snow and a deeper winter snowpack. Glaciers and ice fields provide some of the best ski landing areas. These areas being at higher elevations maintain powder snow conditions as the glacial ice keeps uniformly low snow temperatures throughout the winter.

The camaraderie of flying in Alaska is the best a pilot could possibly find anywhere. This is due to the large number of highly skilled pilots to learn from and talk to about flying. Flying with such a diversity of experienced pilots can be a very rewarding experience. There is nothing like it.

Pilots from the Lower 48 states flying to Alaska to obtain the distinction of being in the Great Land are quite amazing. Many of these pilots fly to Alaska so they can add the experience to their flying repertoire. Most of these pilots land at main airports and remain in Alaska for a few days before returning to the Lower 48 states. These pilots are flying through Alaskan airspace; however, they are gaining very little of what Alaska has to offer. A much better way of exceeding this effort is to take a commercial airliner to Anchorage. Once in Alaska, make arrangements to go flying with several highly experienced Alaskan bush pilots. After flying for three or four days in several taildraggers and landing in dozens of challenging backcountry areas, one will come away from the experience with a thorough understanding of what it is like to fly in Alaska. Most pilots will be impressed well beyond their expectations. Alaska is special with the exhilarating flying environment and the extraordinary pilots.

I was corresponding with a pilot/instructor from the Northwest states about off-airport flying in Alaska. Descriptive narratives were sent by E-mail on this subject but to no avail. Finally, I said, “The only way you are going to understand the way we fly taildraggers off-airport in Alaska is to fly up here on a commercial airliner and go flying with us.” The Pilot did just that and I called it “four days of flying Alaska.” This was the last week in June 2005. The pilot and his companion came up and I arranged two taildraggers for flights each day to backcountry destinations. In the four days of flying out of Merrill Field, we managed to make multiple landings on the Knik River gravel bars, Lake George backcountry landing areas, and fly over the Chugach Mountains at the head of Colony Glacier at 6,000 feet and land on a 400-foot sandbar at the mouth of the Coghill River in Prince William Sound. We landed at Bold airstrip on the east end of Eklutna Lake

in Chugach State Park, in the tundra on top of Little Susitna Mountain at 2,900 feet above sea level northwest of Merrill Field, at Charlie's Bear Haven where we found brown and black bears, on an airstrip on the west end of Beluga Lake near Mount Spurr, on a gravel bar near Strandline Lake, multiple landings on the coastal Susitna mudflats between the Susitna and Little Susitna Rivers, on the mudflats in Turnagain Arm near Seattle Creek, on an inactive mine site near Spencer Glacier on the Kenai Peninsula, and on the Twentymile River at the Head of Turnagain Arm of Cook Inlet. This was a wide-ranging circuit of 1,000 miles (11 flying hours in each aircraft) in taildraggers to the northeast, northwest, west, and southeast of Merrill Field in Southcentral Alaska. The flights were flown in five taildraggers; two Piper Super Cruisers (PA-12s), two Piper Super Cubs (PA-18s) and my Arctic Tern. The Seattle guests enjoyed the flights. They were amazed at the flying skills of the group of self-trained taildragger pilots that could land in so many places in the natural terrain. Nothing can compare with this type of firsthand observation of flying in Alaska. If the many pilots who fly their own airplanes to Alaska chose this type of aviation adventure in Alaska, I am certain that some of them would take the next step and learn to fly a taildragger Alaskan style. I can assure you that it is an unbelievable flying journey that you will take great delight in for the rest of your life. Once you get started, the challenge will become irresistible and you will do whatever it takes to continue the journey.

I take no delight in providing the many accolades for the amazing bush pilots of Alaska because it stirs up too much controversy. Nevertheless, these representations are necessary as the mission here is to present authentic material for a better understanding of what bush flying in Alaska is all about. With 38 years of flying in Alaska, I have the utmost confidence that my compliments provide not only a clear understanding but an accurate one to the reader.

Gary Lickle from Florida presents a noteworthy example of how influential it can be to observe taildragger landings in Alaska. Gary was a 28-year pilot with more than 3,000 hours in a twin-engine Cessna 310. Most of his flying was between the Bahamas and the southeastern United States. Gary came to Alaska in the mid-2000s for a fishing trip at Tikchik Lodge in Southwest Alaska. While out on the river at one of the fishing camps, a Piper Super Cub came in and landed on a gravel bar next to Gary. Gary said, "That landing awoke a new spirit of flying in me. That did it; I

was hooked. Right there I decided to become a tailwheel pilot and experience backcountry flying adventures." That says it all. Gary's long-standing flying career changed forever when he witnessed one Super Cub landing on a gravel bar in Alaska. Gary deserves a lot of credit, for he immediately understood that Alaskan backcountry flying far exceeds airport-to-airport flying. The latter is just flying through the air and very little else. Gary's first taildragger was a CubCrafters Sport Cub S2 with 26-inch Alaskan Bushwheels. He flew the Sport Cub two years before upgrading to the CubCrafters Carbon Cub SS.

Training the Alaskan Bush Pilot Way

Introduction

Many books have been written on bush flying, however, only a few provide instructions on bush pilot training. Three books on bush flying that cover some of the broad aspects of pilot training are *Guide to Bush Flying* by F.E. Potts (1993), *Survival Flying* by Jay Baldwin (2010), and *Bush Flying* by Steven Levi and Jim O'Meara (1992). One other book that is quite helpful in taildragger flying and training techniques is *The Compleat Taildragger Pilot* by Harvey Plourde (1991). All four books mentioned above will provide an excellent beginning for a more in-depth understanding of the Alaskan bush pilot and the training techniques that bush pilots use. These books discuss bush flying and training; however, they do not provide training instructions delivered in an orderly procession that clearly shows a pilot how training is accomplished. This book is essential in filling in the gaps left by the aforementioned books. First, a pilot will never get there without having a complete understanding of what bush flying is all about. This background information is essential. Second, detailed, sequential training procedures about how to get started in learning to train the bush pilot way is also essential. Both of the latter are methodically presented in this book.

Not all pilots want to train as bush pilots; that is a given. Nevertheless, the information on this subject is provided so pilots will have an understanding and the opportunity to train the bush pilot way if they choose to do so. You will never know if you want to train the bush pilot way if you are not well-informed on the subject. Even if you don't ever fly in the bush, the training journey is extraordinary and the learning experience will greatly increase pilot proficiency and a safer flying career. Being a better pilot is a reward in itself.

There are aviation businesses that specialize in teaching the fundamentals of off-airport training. Two in Alaska are Above Alaska Aviation, a limited liability company from Talkeetna, Alaska and Alaska's Cub Training Specialists, a limited liability company from Palmer, Alaska.

One company in the Lower 48 states is Andover Flight Academy from Andover, New Jersey. These aircraft companies provide training operations that can provide a limited amount of knowledge that will be helpful in beginning the journey for training the bush pilot way. However, the lion's share of training the bush pilot way is substantially different from what these companies offer.

Alaska's bush pilots start out like all pilots with basic training from FAA-certified instructors. However, after a pilot license has been obtained, that is when the adventure begins for the Alaskan or other pilot who is inspired to train like the legendary Alaskan bush pilot. To obtain the correct mindset, the pilot has to understand that for the most part FAA instructors do not teach bush flying skills that off-airport pilots are seeking. Mort Mason, a bush pilot and Alaskan registered guide with 35 years (18,000 hours) of flying in Alaska's backcountry, said "In all that time, I never once came across a bush pilot flying course of any nature." Mason retired from his Alaskan flying career in 1985.

The pilot has to take on full responsibility for self-training. Pilots have to understand the challenges ahead and it is mandatory that they place the responsibility for training on their own shoulders. The training is about you and your airplane. Once you understand the latter, you're on your way. It is really as simple as that. What has been stated above does not discount occasional FAA instructor training. The most important step to take is to talk to and fly with the most experienced Alaskan bush pilots you can find. It is more productive for each pilot to fly in his/her own airplane. You can fly as a pair of two airplanes. Flying with other skilled bush pilots will be of enormous benefit in learning new skills at an accelerated pace.

Self-training to become a skilled bush pilot in Alaska takes on a leading role and a journey that most pilots would not expect. It takes a huge amount of time; many hours of practice, drill, routine, and so forth. The pilot should plan on flying a minimum of 100 hours each year. Even with my full-time employment and working 50-hour weeks, I managed to fly well over 100 hours every year. It can be done. And don't expect to enter that hallowed ground with the highly capable Alaskan bush pilots until you have several years of learning under your belt. It also takes an open mind with the courage to explore and a willingness to make trials to learn all facets of flying the aircraft. Information or training techniques provided by an instructor or any other pilot has to be fully analyzed, understood, possibly

modified, and only then incorporated into your flying skills. Copying instructors' or other pilots' flying techniques without analyzing and adjusting them to fit your own ability and natural traits is a wasted effort. It is not that important how you perform a certain technique in flying your airplane as long as you understand it and can consistently carry out the procedure in a safe and practical manner. The great bush pilots in Alaska apply their own true and tried techniques. These techniques vary from pilot to pilot.

The primary reason training the bush pilot way is unparalleled is that the pilot is exclusively engaged in the most creative process for learning that is possible. How can pilots or others learning any subject be more resourceful than developing their own programs that fit their own personalities and individual traits? This is the reason this type of training is so potent. Self-training caters to your own individual traits and makes learning less difficult. This is the beginning in learning to be "your own pilot." With an open mind, it is incredible how much the brain can facilitate learning in this manner.

The FAA certified instructors teach training techniques that have standardized procedures. One shoe fits all pilots. The pilots memorize or write down flight speeds for all types of maneuvers. You will be flying by the book and reading the speeds from the gauges. The pilot is not leading the training; he/she is following the instructor's training program. This type of teaching can be difficult to understand and learn and often is lacking in comprehensive coverage. Instructor training beyond the private pilot's license can dampen and often kills creativity in a pilot. Creativity is the stalwart of self-training, becoming your own pilot and categorically is the bush pilot way for training. Pilots seeking further training need to venture out on their own and learn to be creative and innovative. That's the key to becoming the best pilot you can ever be.

The bush pilots in Alaska discovered many years ago that they had a training strategy that really works. They have never wavered once about how they train because it has been exceedingly productive throughout the entire era all the way to contemporary time. There is also no way to deny the outstanding results from pilot self-training the Alaskan bush pilot way. This tells the complete story. It has always been controversial but it has always been the "gold standard" for Alaska's bush pilots. The Alaskan bush

pilots would not have it any other way because the rewards are too great to pass up.

How the Alaskan bush pilots trained for all these years is now being brought to life by Sir Ken Robinson, an internationally recognized leader in the development of education. Dr. Robinson, Professor Emeritus of Education at the University of Warwick in the United Kingdom, is calling for a revolution in education. Dr. Robinson says that students need to be educated in an environment where they can confidently use their own independent thinking and preferences for learning. This leads to creativity and is the key to innovation. This should be the new paradigm for university education. Dr. Robinson stresses that the current conformity and standardization of education are features that are contrary to the kind of original thinking and confident imaginations that underpin real innovation. This type of training involves the students' taking control of their own educational program. This comes down to self-training, just like the training the bush pilots have been engaged in all these years. What a revelation finding out that Alaskan bush pilots have been ahead of the pack training the best way possible for decades in remote Alaska. Bush pilot training will endure forevermore.

One additional affirmation for the value of self-training is eloquently covered in the book *Super Brain* by Deepak Chopra, M.D., the author of more than 65 books and Rudolph E. Tanzi, PhD, Harvard Medical school professor of neurology, one of the world's foremost experts on the causes of Alzheimer's. *Super Brain* is a user's manual that shows you how to effectively use your mind to cultivate and reshape the brain to best serve you. The professors sum up their book as follows: "In contrast to the baseline brain that fulfills the tasks of everyday life, Chopra and Tanzi propose that, through a person's increased self-awareness and conscious intention, the brain can be taught to reach far beyond its present limitations. Through a new relationship with the brain, you can transform the brain. In *Super Brain*, Chopra and Tanzi guide you on a fascinating journey that envisions a leap in human evolution." How is all of this mind–brain connection accomplished? It is accomplished by self-training. You must take command to guide and reshape your brain so that you can attain maximum benefit. Self-training is becoming paramount in the lives of all who expect to attain the most in life. You must self-train the mind to achieve your very own super brain, you must self-train yourself for the

highest and most productive education possible, and you must self-train yourself if you want to become the best pilot you can ever be.

The FAA does not support Alaska style bush pilot training. They say it is too dangerous to tell a pilot to go out and learn to fly by self-training; too many pilots will crash their airplanes. The FAA says that we have our own training program with Certified Instructors and after obtaining your private pilot's license, we do not restrain you from training as you desire. Bush pilots tell me that they are content that FAA is not involved in bush pilot training because the government would degrade the program.

The Training Begins

I will never forget the quandary when I first wanted to begin training as a bush pilot in Alaska. I had a difficult time finding out very much on this subject even though I was talking with as many bush pilots as I could find. Information was provided but it seemed so fragmented and incomplete that it was demanding to understand. The first idea that many pilots mentioned was that you must learn to "fly by the seat of your pants." I had heard this before but had no idea what it meant. As I met new bush pilots I asked for more details about flying by the seat of your pants. This subject was becoming so baffling that I decided to put it aside for the short term and pick it up later in my training program. I knew this was important but I'd make another attempt after I gained additional experience.

Other bush pilots suggested that a good starting point is to concentrate on learning the technical skills for precise spot landings and takeoffs in natural terrain. I was told not to train at airports or even on landing strips but to find a gravel bar that was sufficiently long to provide training for maneuvers in a safe manner. Many pilots told me that the best training ground was the Knik River gravel bars. This undeveloped area is southeast of Palmer, Alaska and is only 30 air miles northeast of Anchorage. The Knik River is a typical, much-braided, glacial river system. The river is 2 to 4 miles wide from Butte, Alaska to the toe of the Knik Glacier 15 miles upstream. This extensive area encompasses almost all natural sand and gravel bars that are mostly free from vegetative growth. After checking out the training opportunities on the Knik, I was very much impressed with such an appropriate place to train so close to Merrill Field. You can always select your own training area and never have to be bothered by other aircraft complicating your training, wasting your time, or distracting you.

Training for this mission is more comprehensive and takes more time than you can ever imagine. This is the traditional entry step into the bush pilot's flying world. The training time and the thoroughness of the training can never be overestimated. Even after you have learned and perfected this part of bush flying, you will still need to practice this type of training in perpetuity to maintain a high proficiency rating throughout your flying career.

The first step is to fly to the Knik River or your selected training area and locate a gravel bar (sand bar is also acceptable) that is suitable to meet the pilot's need as a safe place for training. Remember; pick your own landing site with no visible airplane wheel tracks. You want the training experience to be on natural terrain because that is what you will be seeing over and over in the future for landing places. Make sure it is long enough so you won't have any problems in your routine practice maneuvers.

Once you have selected a gravel bar, the next step is to land your airplane. Then mark off with flagging material tied to rocks, stakes, or plastic cones a rectangular box 60 feet wide by 20 feet deep at the end of your landing area. Make sure to leave plenty of space for a suitable landing if you touch down short of the box. This training box is for learning to land your airplane with the utmost precision. The goal here is learning to place your wheels in this box at stall speed on every landing. The details of this mission are twofold— wheels have to touch down in this box and the wheels have to touch down at stall speed. Both of these training operations have to come together as the wheels are touching down. They have to become routine and easily doable every time you land your airplane. You'll want to practice the precision landings in variable weather conditions. Make certain you practice on days with every type of wind conditions; steady winds, gusty winds, headwinds, tailwinds, crosswinds, quartering winds, and so on. Also practice on calm days, hot days, and cool days. You'll want to experience all conditions. Later on you will be free from surprises which are a great advantage in flying your aircraft.

It will be necessary to go out and train on the selected gravel bar in two- to three-hour sessions twice weekly. This type of training should continue to be in your flying program for as long as it takes to achieve precise landings in the box on every landing attempt in all weather conditions. The reason this type of training is so important is that landings off-airport can cause challenging problems that often lead to aircraft accidents. These

accidents are primarily caused by imprecise landings of coming in too high, too low, and too fast. Touching down faster than stall speed causes many accidents as airplanes can quickly get out of control. With the extra speed, the airplane is energized. This increase in kinetic energy with an airplane out of control provides the path to massive aircraft damage. Coming in too high will often lead to touching down a long ways past the end of the landing area. This leads many pilots to make a go-around because they may not have sufficient distance to stop before running off the end of the landing area. Go-arounds that are not well thought out can lead to aircraft crashes beyond the landing area. This happens because airplanes don't always have the power to advance to flying speeds in a high-angle climbing mode. The airplane usually responds by climbing in ground effect; however, it will slowly lose altitude and crash into the natural terrain as the forward speed does not build up fast enough to support flying speeds. This is a common cause of off-airport accidents in Alaska and it happens over and over again. After you have become an expert in landing in the box, you will still need to practice this exercise intermittently for as long as you are a pilot to maintain the highest level of proficiency.

Takeoff Operations

Takeoffs have always appeared to be straightforward and easy to perform. However, a few guidelines are in order. Taking off on short operational areas, for example, gravel bars, pilots have to learn the distance they need for taking off. A reasonable percentage (20 percent) should be added to the distance for safety considerations. Pilots have to get use to not being able to have an operation area long enough to abort the takeoff at the halfway point if things do not appear to be suitable. There is no option for aborting takeoffs. If this had to be accommodated, off-airport operations would most likely be restricted to lengthy backcountry airstrips. This would just about completely negate the ability of bush pilots in Alaska to land on so many short landing areas. That is why all the practicing is necessary; the pilot is becoming highly capable with all the routine drills.

Another important item to consider on takeoffs is to use most of the operational area available for takeoffs. This means that it is not advisable to get airborne as quickly as possible because the airspeed is too close to stall speed at a high angle of attack. You don't want to stall the airplane and crash on a takeoff. This can happen with a quick lift off the ground when

heavily loaded or in gusty wind conditions. A better and safer alternative is to use most of the takeoff area. When the airplane becomes airborne, it has a stronger climbing factor built in with the higher flying speed.

When taking off from a short landing area, it is advisable when the airplane lifts off to leave the high-angle takeoff configuration for a short time and then to lower the nose to almost level attitude so the aircraft can quickly build airspeed. Make sure the airplane is above treetop level before lowering the nose. Increasing flying speed is your friend on takeoffs, especially when the airplane is heavily loaded, in windy conditions, and on hot days. You are much less likely to stall your aircraft.

Short field takeoffs require lifting the tail off the ground as soon as possible. Having the airplane in a level attitude as it advances for takeoff without flaps will allow the aircraft to build forward speed faster than an airplane in a three-point attitude or with flaps set. Once the airplane is ready to fly, pull the flaps to the proper setting. This will provide the shortest distance needed for takeoffs. Setting the flaps on initial takeoff will shift partial weight from the tires to the wings. Shifting the weight to the wings greatly slows down the building up of forward speed. Soft field takeoffs require adding the flaps soon after opening the throttle so that a substantial amount of the airplane’s weight can be shifted from the wheels to the wings. It is also important to keep the tail down to prevent the airplane from nosing over when soft ground is encountered. Soft field takeoffs require longer ground rolls.

One additional point that needs to be mentioned is that the propeller can be damaged from turning the airplane on the ground and from taking off from unimproved landing areas. A whirling propeller can suck up sand and gravel that can damage its leading edge. This will require filing the dents to smooth them out and prevent propeller blade breakage. Equal filing will be required on both propeller blades to keep them in balance. Pilots must learn how to operate on natural terrain to avoid propeller strikes. Propellers are expensive and need to be safeguarded.

When taxiing airplanes on natural terrain with exposed sand and gravel, the bush pilots avoid most propeller strikes by using taller landing gear and by using Alaskan Bushwheels (tundra tires). Both of these raise the aircraft higher from the ground and thus provide greater propeller clearance, which will help reduce the propeller’s ability to suck up sand and gravel projectiles. Another important remedy to the propeller strikes is to learn to

properly handle the aircraft on the ground. When you want to turn in these conditions, don’t let the airplane slow down to a near stop, push the throttle in, and attempt to turn. This will require high power settings that will usually suck up sand and gravel. The proper way to taxi is with a brisk amount of speed, letting the momentum help turn the airplane. A small burst of power will be needed but the power won’t be enough for the propeller to pick up sand and rock pieces. Raising the tail and using the rudder as the turn is being made is also beneficial. This helps to move the tail around with little engine power.

Landing Operations

When flying in for landing, remember that bush pilots are known for being unorthodox pilots. We don’t need standard landing patterns. This means that you need to practice all training operations in an unplanned manner. Come in and make your approach for landing different each time, for example, variable altitudes and speeds, straight in, turning maneuvers and so forth. Flying as unconventional pilots has substantial benefits. First, it is much easier not to have to write down and memorize standardized flying operations which you soon forget. Second, when you learn to be comfortable with your aircraft in variable positions in relation to your landing surface, you’ll have become a much improved pilot. You will learn to observe your aircraft’s position and to quickly change it to whatever you desire. All these training sessions are based on common sense, proper judgment, and routine practice. Once you obtain sufficient training time with this type of flying, you will be changed to a more complete pilot who has seen many challenges and has learned how to alter them as necessary. With all this unconventional training, what you are hoping to gain is not finding any new surprises. You have seen them all and you know how to handle them.

Learning to land your airplane at stall speed is really beginning to learn to fly by the seat of your pants. You don’t look at any instrument; you just watch the airplane. It tells you everything you need to know. This is really a simple maneuver and is easy to learn. Just go in for a landing on a long airstrip. To make it easy to learn, don’t flare your airplane. Just go in as straight and level as you can. As your airplane is flying its horizontal path, pull back on the throttle and let your airplane continue to slow down until you notice a pronounced vertical downward motion. The point where the

airplane starts its downward motion shows the “initial stall.” This is as slow as your airplane can fly. So you don’t fall out of the sky, add a small burst of power with the throttle and continue to gradually settle into a landing. This is touching down right at stall speed. It is important to get this correct. You don’t want flying speed when you are landing; it is too fast. You don’t want stall speed; your airplane falls out of the sky like a rock. What you want is initial stall speed. This is the speed that barely keeps your aircraft airborne as it settles to a landing in a gradual and slow deceleration. When flying in strong gusty winds, it may be necessary to come in at slightly higher landing speeds than the initial stall speed so that the airplane does not go into a hard stall due to a lull in the wind or a strong rogue wind blast.

Some pilots have a phobia about stalling an airplane. Think of it this way—what difference does it make if you stall your airplane at 1 or even 2 two feet above the ground? It really does not matter. No harm will be done. Of course you don’t want to stall your airplane at 20 feet above the landing surface and let it fall to the ground. This should never happen; all you have to do to avoid this type of stalling is to open the throttle and add a burst of power. Then pull back on the throttle. Your airplane will respond from its initial stall speed and gradual descent to flying speed and level flight. Use the throttle with a burst of power whenever it is needed to stop a stall. Learning to use the throttle intermittently when coming in for a landing is essential—learn this technique in a precise manner.

There are two basic types of landing styles for taildraggers. These are the three-point landing and the wheel landing. The three-point landing requires the airplane to be flown parallel to the ground until it stalls and settles to the ground, touching down concurrently on all three landing wheels. The stick is pulled all the way back at the time of contact and held there throughout the landing roll. Stopping is boosted by moderate braking. The wheel landing is also performed by flying parallel to the ground but the landing is made on the two main wheels. The airplane has to be at initial stall speed or carry a small amount of speed above the stall speed to fly it in and land on the main wheels. As soon as the main wheels touch down, the application of forward elevator (stick forward) has to be made to reduce the angle of attack and keep the main wheels on the ground. The tail of the airplane will descend on its own with the stick in forward position. Once the tail is on the ground, apply full back elevator to keep the tailwheel on the ground. Use moderate braking to shorten the ground roll. Most bush

pilots have learned both of these landing procedures. They can perform both well. Under certain circumstances (low wind conditions) the three-point landing may be performed. However, under strong gusty winds (especially strong crosswinds) the wheel landing is necessary to properly control the airplane so it does not wind up in a ground loop. Wheel landings are preferred by most bush pilots and many use them for all landings. Other advantages of wheel landings are that you have maximum controllability of the airplane through the touchdown point and excellent visibility during the landing run. Wheel landings are also safer when landing in low light and when carrying heavy loads. Wheel landings reduce the likelihood of rocks kicked up from the main wheels damaging the fabric on the undersides of tail surfaces. When coming in for a wheel landing with minimum power, a small burst of power from the throttle may be necessary to maintain flying speed and aircraft stability prior to landing.

For wheel landings, bush pilots learn two techniques. One is a steep approach to landing and the other is a shallow approach called “dragging it in.” The latter provides landings that are usually under or over the desired touchdown point. This may result in longer landing distances. The steep approach to final is far more accurate in spot landings and the steeper approach dissipates much more kinetic energy when the wheels touch down. For both of these reasons, the steeper approach to landing provides shorter landings. Therefore, it is traditionally the bush pilot method for landing.

Bush pilots learn to slip an airplane on final approach if they need to lose altitude fast because they are coming in too high. This is a cross-controlled maneuver accomplished by a left or right aileron and the opposite rudder. Check your Pilot Operating Handbook (POH); Cessnas may not recommend slips. If there is a crosswind, place wing down into the wind. Immediately after touching the wheels on the ground, make sure to quickly release the flaps. This is important because all the energy in your aircraft has to be dissipated. Transferring the weight from the wings to the wheels will help facilitate the slowing down of the aircraft much sooner than if the wings are carrying a substantial part of the weight. This is also very important on windy days as the airplane could easily begin to fly again with the flaps extended.

Soft field landings should be made without the use of brakes although minimum braking may be acceptable under certain circumstances. Retract

the flaps after the airplane comes to full stop. If the tail comes up, an application of throttle and full back stick may force it back down.

Landing on sandy beaches can be challenging, especially on sloping ocean beaches. Landing on ocean and lake beaches may be the second most important places to land airplanes in remote areas of Alaska. This is after gravel bars (also includes sandbars) along rivers and probably ahead of landing on tundra and other grass-covered areas. Landing on a sloping ocean beach will take lots of practicing to get comfortable with making these landings as they are atypical. When coming in for a landing, you will need to place one main wheel on the sand; that is the upslope wheel. Keep the airplane on a straight line down the beach with proper use of the aileron and rudder. The other wheel is high in the air above the beach. As the aircraft slows down on the landing roll, the wing will lose lift and the airborne wheel will gradually touch down at a slow speed. Landing on two main wheels will cause the airplane to veer left or right depending on which wheel encounters the most resistance or drag. Beaches are usually plenty long enough that brakes are not needed. If brakes are used, use them sparingly. The takeoff is made the same way as a landing. In the ground run, as soon as possible, shift the airplane to one main wheel; the wheel on the sand is again the one on the top side of the beach. This is an exercise in the coordination and proper use of aileron and rudder. Beaches with 20 percent or higher slope angles can safely and easily be landed on with this method. Practice one wheel takeoffs and landings at your home base airport.

When taxiing your aircraft on beaches, be careful to look for and stay clear of dead tree logs, large cobbles, holes, seaweeds, and soft muddy areas. Turning your aircraft on beaches, especially sloping beaches may be made much easier by shutting down the engine, exiting the aircraft and turning it around by hand. Turning an aircraft in loose sand, especially with increased throttle, will often result in picking up sand that will chip away at the propeller.

After extensive training for landing operations in the backcountry, a typical landing should look like the following. Fly into a prospective landing area and fly low-level approaches parallel but offset from the landing area at 50 mph (one notch of flaps). You’ll be able to see much more detail at slow speeds compare to normal flying speeds. You are looking for how smooth or rough the landing surface is; for holes and

swales in the landing area; logs or other woody debris lying along the landing area; the height of any vegetation (brush) that you may be landing in; the size of stones (gravel-sized rocks or cobbles). You will want to estimate the length of the landing area and determine if it is sufficient for landing under the weather conditions (primarily wind) that currently exist. My estimation of a 300-foot landing area from the air is much more accurate and quicker to determine than attempting the flying at a known speed and counting the seconds of the landing area to determine its length. When all factors have been evaluated you should feel at ease and confident that this is a suitable landing area for your airplane on this given day. If I feel hesitant or apprehensive about landing after evaluation, I usually don't land. A difficult, unsuitable landing area always causes an uneasiness in my gut. To be safe, I quickly depart the site and find a safer landing area.

After rigorous training twice weekly for a few months, you should by now have perfected your takeoffs and landings. To retain your proficiency, you'll need to continue practicing takeoffs and landings monthly. At any time your takeoffs and landings fall short of your expectations or appear to be inconsistent, you'll need additional training to recover. Drill, drill, and drill until you reach a satisfactory conclusion. Remember that the training is simple; however, there are no shortcuts or escapes from spending the proper time to accomplish the mission. One additional reminder is to make sure you are landing precisely in the box at stall speed each time you go in for a landing. If there are any failures, you may need to refocus your training on precise landings until you are bulletproof.

Managing the Wind

Wind can be your greatest friend and also your greatest enemy. It will always be your greatest friend if you learn how to accurately determine wind speed and direction, understand how it affects your airplane and use common sense maneuvers in windy conditions. Pilots are still saying that before landing, you look at leaves on hardwood trees and bushes or water on a lake to determine wind direction. All pilots should know by now that one of the most important uses of the GPS is that it is constantly reporting your aircraft's ground speed. This will allow you to determine wind speed and direction prior to landing. You already know your cruise speed when flying on a windless day; for example, 100 mph. All that is necessary is to fly both directions across the ground where you plan to land. Note the

ground speed in both directions. If the wind is blowing, one will be lower than your normal cruise speed, for example, 90 mph. This indicates you are flying into a 10 mph headwind. The other direction will show 110 mph. This is a tailwind or the direction the wind is blowing. You'll need to land with the lower ground speed which is into the wind.

On windy days it is important when flying these ground speed detection flights to look for quartering or crosswinds when flying back and forth across your landing area. The strongest winds may be quartering or crosswinds. Fly the crosswind routes and determine the ground speed your aircraft is flying. This will provide precise wind speeds of the quartering and crosswinds. If you find the strongest winds are quartering or crosswinds blowing at 30 mph, you may consider landing somewhere else.

Your airspeed is one of the most important items to consider when making off-airport landings. When the wind is blowing, make certain that you take advantage of it. This means almost always landing into the wind. Headwinds of 10 to 15 mph greatly assist in landing your airplane. The headwinds lower the ground speed of your aircraft by that amount making landings slower and safer. Your airplane has much less kinetic energy and therefore the braking and landing roll is greatly reduced. Short landings are required for off-airport operations. The opposite is the case when you land your airplane with a tailwind. With an increase in ground speed from the tailwind, you have greatly energized your aircraft. This makes landings more problematic and difficult. The landings will be at a greater ground speed. This will result in a longer landing roll with heavier braking. It is much easier for your aircraft to get out of control and crash when landing at higher speeds with huge amounts of kinetic energy in your aircraft. It is wise to limit tailwind landings although sometimes they are necessary.

Crosswind Operations

Crosswind takeoffs require keeping the windward wing down with proper use of the aileron. A right crosswind will require full stick to the right before the throttle is opened for takeoff. The aileron will be raised on the right or windward wing. Opposite rudder is required in the takeoff run to keep the airplane tracking straight down the runway. The tail should be raised slightly higher than for normal takeoff so the airplane can accelerate to a higher speed before becoming airborne. After the airplane becomes airborne, relax the rudder and allow the airplane to weathervane into the

wind. The crosswind takeoff will require a substantially greater distance on the ground roll when compared to the standard takeoff into the wind. Always prepare for this on a short field takeoff.

Bush pilots learn the wing-down and the crab method for performing crosswind landings. The wing-down method is traditionally used as it is more precise compared to the crab method. It is performed by keeping the windward wing down by use of full aileron into the wind and opposite rudder to keep the airplane aligned with the centerline of the runway. This is a cross-controlled maneuver. A wheel landing is made by touching down the main wheel which is into the wind. The other wheel comes down on its own after the airplane slows down and sufficient lift is lost.

When making crosswind landings, always be creative in your thinking. If you have arrived at your landing area, which has only two directions for landing, and find a sizable crosswind component, instead of trying to decide how you are going to perform this difficult landing, look for alternatives first; find a way to land your airplane into the wind. Landing into a stiff wind is always the best option. It is surprising how many times you can find a way to locate a place to land that is into the wind instead of the routine landing with a crosswind. An example of this was the landing in my Piper Cub many years ago at the Dillingham airport. Dillingham has a paved runway that is 6,400 feet long and 150 feet in width. The wind on the day I arrived was a direct crosswind blowing at 30 mph. The only creative way to make this landing less difficult was to land on the paved runway diagonally to reduce the angle of the direct crosswind. I still considered this too risky and decided that I should not attempt a landing on the main runway. I was low on fuel and needed to land at the airport for refueling. Maybe I could find a place to land on the Nushagak Bay beach or in the tundra near the village. Flying near the airport I noticed that a taxiway was aligned directly with the wind. Dillingham being such a remote and small village, I decided to call Dillingham airport and ask permission to land on the taxiway. I was very surprised when told that I could land on the taxiway but it would be at my own risk. I was also warned that hangars are on one end of the taxiway and to be careful not to crash into them. I was so relieved and although it is not normal to line up and land on a taxiway, I had no concerns because it was plenty long enough and the most important consideration was it was directly into the wind. This turned out to be a safe and stress-free landing. My takeoff was on the same taxiway. The main point to take away here is

that creative ideas don’t just happen; you have to use your incredibly creative mind to seek out alternatives that are useful and different from the ordinary or standard procedure.

Measuring Landing and Takeoff Distances

Now that you have a sufficient amount of basic training in takeoffs and landings and have learned to make precise spot landings, it is time to measure the distance required for takeoff and landing your airplane. It is essential to know these in accurate measurements. You can utilize the same landing area you have set up for spot landings. You can place your wheels in the training box for takeoffs and for landings. You’ll need to mark each 100-foot section beyond the box for up to 600 feet. Use brightly colored 6-by-8-inch cones or flagging material tied on rocks or stakes to one side of the runway.

Remember to come in for landings at different speeds and heights. Don’t use a pattern approach like you use when landing at regular airports. If you are too high and need to lose altitude fast, learn to be a professional at slipping your aircraft. This is a cross-controlled maneuver; full left or right aileron and opposite rudder. If there is a crosswind, make sure you place the wing down into the wind. With a crosswind landing, touch down on the main wheel into the wind. The other main wheel will slowly fall to the ground as the forward speed slows down and the wing can no longer carry the load.

The first lesson is to measure your aircraft’s takeoff and landing performance. Each time you take off note how many feet of runway are required to get airborne. Do the same for landings; write down the numbers for your landing roll. Use moderate braking pressure. This information is very important when selecting a short landing area in natural terrain. You never want to land your airplane if you don’t have sufficient distance for a take off. You also need to find out the difference in feet required for takeoffs and landings. Compare the two measurements and use this information when selecting a landing place in future flights. Of course, these measurements will change as you get more precise with your landings. After some time, you’ll be more certain that the measurements are constant and you’ll know that your aircraft can land shorter than it can takeoff, or it needs the same distance for takeoffs and landings, or the third option is that it requires a longer distance for landing than for taking off.

Remember to practice this type of training in all sorts of weather, for example, cool days, hot days, calm days, headwinds, tailwinds, crosswinds, quartering winds, and others. Also vary your airplane cargo loads.

Selecting Landing Areas from Your Cockpit

Selecting landing areas from the cockpit of your airplane can be difficult or next to impossible if you don't learn how to properly do this. There has to be a way of verifying what you are seeing from your aircraft to what is the true situation on the ground. Routine training is necessary to fly over the potential landing area and look for key factors that have to be evaluated. First look at the length of the landing area and estimate its length in feet. Next look to see if the landing area is level or sloping. If sloping, estimate the percent of slope. Determine if the landing area can be used in both directions or is this landing area a one-way-in and one-way-out operation. Next, look for obstacles that can interfere with your landing or takeoff approaches; these are vegetation (bushes and trees); cut banks near a river, hills, and other impediments. Contemplate whether the landing area is long enough for landing and taking off given your airplane's loaded weight (cargo, fuel, passengers), the obstacles present, the slope and the weather conditions (especially the wind). Next, look for surface roughness of the landing area. Look for dips, holes, and swales and estimate their depth in inches. Next look at the rocks and stones and estimate their size (diameter in inches). Then look at the height of vegetation and trees that may interfere with your landing. Estimate the vegetation and tree height in feet. Estimate wing clearance from the vegetation. Also estimate propeller clearance for the brush that may be in the landing area.

Now, go in and land and park your airplane. Next, walk down the landing area and on the ground and obtain measurements of the length of the runway (you can step this off in 3-foot strides if your steps are accurate), the height of the brush and the trees (may want to use a tape measure), measure the depth of the dips, holes, and swales with the tape and measure the size (get the diameter in inches) of stones and cobbles. The measurements you obtain on the ground have to be compared to what your estimates were from the airplane. When your estimates don't match, you'll have to adjust them so that they will be more accurate the next time. If you keep doing these estimates from the air and compare them with the actual measurements on the ground, you will find that you can estimate these

variables very accurately. You have to be good at this so you don’t get surprised with a deep swale that was not detected. This could result in a broken landing gear or even worse, a nose-over. When evaluating landing areas, it is important to add one notch of flaps and fly slower than cruise speed for much improved accuracy. The above training technique for evaluating a landing area from the air refers to a gravel bar.

River gravel bars (including sandbars) are the most frequently used offairport landing areas in Alaska because they provide the best landing areas by a wide margin. Other landing areas frequently used are sandy and gravelly ocean and lake beaches. Gravel bars on rivers are firm, they are bare, and you can see exactly what is there. Vegetation on gravel bars is usually suppressed so it isn’t a problem. Approaches to landing on river gravel bars are usually very good. Landing on grass-covered terrain is much more problematic. The grass can be slippery. It can be wet with standing water not detected from the air. The ground can be very soft and muddy. With only 12 inches in height, grass can completely hide a hole or a log. This can result in landing gear damage, or even worse, a nose-over with considerable damage to the airplane. Many accidents in Alaska are the result of landing in grassy terrain. These accidents often happen in remote areas far from repair services.

When evaluating a landing area from the cockpit, make sure you know your airplane’s performance capabilities. Does it require a longer distance for takeoffs than it requires for landings? Does it require the same distance for landings as it requires for takeoffs? Or does it require a longer distance for landings than it requires for a takeoffs? Your aircraft loads, density altitude, and wind conditions must also be used for making accurate evaluations to determine landing and takeoff distances required. Add a safety margin of 20 percent. Example: a required 300-foot landing area would be increased to 360 feet for safety considerations.

Flying by the Seat of Your Pants

After learning to decipher initial stalls for the purpose of landing at the slowest speed the airplane can land, I began to venture out and think more about flying by the seat of your pants. In the end, what I have learned is that flying can be accomplished entirely by simply seeing, feeling, and hearing what your airplane is telling you. The airplane never lies and all variables such as wind speeds and directions, density altitude, and other factors are

incorporated into what the airplane is experiencing. This will lead to a simpler way of flying that is much more precise than using instruments. The airplane will tell you everything you need to know. Just pay attention and learn what the airplane is indicating by its signs. Early on, I really thought that there was no way this made any sense or that it could be productive. However, I never once doubted the bush pilots' traditional training ways. The key here is to trust the training and to have an open mind, and slowly this simple and accurate way of flying will show up in your training repertoire. One day after many training sessions, it will show up and you will recognize it. You will be so relieved that the bush pilot way of training is finally coming alive and you have succeeded on your own in learning it. What an accomplishment. You now have something that you are proud of and something to celebrate. This progression will show you that you can get the job accomplished. It will be a strong motivating force in continuing your training in all other areas that are needed. Building your confidence in this way is the beginning of becoming your own pilot.

Situational Awareness

Situational awareness is one of the most important aspects of flying. It is especially important in bush flying with all the challenging events of flying at low levels that often happen in rapid succession. Pilots need to have a very active thinking mind to observe and to be aware of everything that is happening around them. When I am tired, sleepy, or don't feel well, I don't fly. Situational awareness helps tremendously when applied to discerning changes in weather. Situational awareness is needed not only in forecasting weather but in all other conditions associated with flying. Examples of the lack of situational awareness is a pilot stating after an aircraft accident that "the wind picked up my right wing and turned the aircraft over into the ground," or "a strong gust of wind caught my airplane and forced it down hard on the runway breaking the landing gear." If you have situational awareness you'll be more alert and watching for these likely events when flying on windy days and you will have a better opportunity for quicker reaction and pilot maneuvers to prevent accidents. Situational awareness provides the frame of mind and the focus on the critical events to counteract difficult flying challenges and to help in preventing accidents.

Learning to Read the Weather

Weather dominated my first few years of flying in Alaska, especially on cross-country flights over remote and unpeopled lands. A flight from Merrill Field to Iliamna, which is 230 miles southwest of Anchorage, almost always presented very challenging weather-related problems. The flying route is along upper Cook Inlet, where fog can be a problem in summer. Then the route passes through the Alaska Range with valleys near sea level and mountains with glaciers to over 10,000 feet. The route passes through mountains on both sides for over 100 miles as you fly through Lake Clark Pass. Fog and gusty winds at Iliamna are notorious. It always seemed like you could never make that flight without finding challenging and difficult flying conditions somewhere along the route due to the weather. I was always briefed on the weather before beginning the flight. Since I am not a meteorologist, often I did not fully understand the weather conditions well enough to be prepared for the flight.

I tried the go-or-no-go strategy after obtaining a weather report but it provided little or no advantage. It was always very unnerving to me to find that somewhere along the way the weather report was incorrect and the flying became problematic, difficult, and stressful. Because the weather reports gave flyable weather conditions, I would keep flying when I should have turned back. More times than you would expect, current weather reports were unavailable for the areas you were flying in or you could not contact the radio frequency to obtain a weather report when flying. All of this presented a chaotic condition when weather was brought into the flying equation.

To provide a more comfortable environment, I would obtain the weather report and begin the flight if weather conditions were not atrocious along the way to my destination. However, I was more concerned with the weather conditions where the flight was being launched. Merrill Field is only 137 feet above sea level but is built on a slight knoll. From Merrill Field, on a clear day, a pilot can see the snow dome of Mount McKinley, 130 air miles north-northwest. Pilots can also see Mount Susitna (4,396 feet), 40 miles northwest; the snow-covered Mount Spurr (11,070 feet), 80 miles west in the Alaska Range; the Talkeetna Mountains, 35 miles northeast; the Kenai Mountains 18 miles south; and the Chugach Mountains, 5 miles east. When I arrive at Merrill Field, I take a panoramic look at the above-described viewpoints and make an evaluation.

Do I want to fly in these conditions? If the answer is yes, I fly out of Merrill Field. If the answer is no, I hold off to a later time when the weather is more to my liking. The weather reports do little to change my own evaluation of the weather I'll be flying in when departing Merrill Field. A second and most important element I have incorporated into my flying repertoire related to weather is to be my own weather forecaster. As I fly toward my destination (Iliamna), I am constantly looking out, evaluating, and making a forecast of how the weather will change in five minutes, fifteen minutes, half an hour, and one hour. I use my own weather forecasting to provide real and accurate data essential for safe flying. This way of reading the weather has been the most innovative and successful way to manage this difficult and ever changing condition in Alaska. Being your own weather forecaster, you always have the information you need right out there in front of you. My confidence and comfort are off the charts and far above inaccurate, difficult-to-understand, and missing weather reports. When conditions deteriorate, I immediately recognize them and determine if the trend is continuing in a downward spiral. Once this has been determined, I'm not concerned with flying in dangerous weather conditions to reach my destination—far from it. My goal is to find a place to land my airplane. All I need is a reasonably smooth gravel bar that is at least 300 feet in length. I have done this many times and it has always been the rational thing to do. Many times the weather will improve so that the flight can be continued in a few hours. Other times an overnight is required. This was never a problem as I have survival gear, tent, food, stove for cooking, and other essential camping gear.

The important question is, Can a novice really learn to be a reasonably accurate weather forecaster? I tried it and I do think I have mastered it. It has worked marvelously for many years without once leading me into a catastrophic weather problem. My take is that pilots do a majority of their flying within 100 miles of their home base. Learning to forecast the weather in a confined area in which many flights are made over time provides enormous learning opportunities. This is a trial-and-error way of learning. You make your weather forecasts based on current weather conditions. When time passes, remember the forecast that you made and compare it with current conditions. When you continually evaluate weather conditions over time, you will gain more confidence that you really can do this. Flying

in the same area most of the time, the weather has only so many tricks up its sleeve and over time you'll learn most of them.

Nothing I have done as a pilot has been more satisfying than learning to interpret the weather and becoming my own self-reliant weather forecaster. After learning this, I have been able to fly in a stress-free atmosphere with complete confidence in all weather conditions. I use weather reports although I can easily fly without them. I consider weather reports secondary because I have the most accurate weather data right out in front of the airplane. All I have to do is to monitor and evaluate them. The flying described above is for Visual Flight Rules (VFR) pilots, as I don't have training or instruments to fly Instrument Flight Rules (IFR).

Emergency Equipment

You will need to carry in your airplane sufficient equipment and provisions that can sustain you and your passengers for at least one week. Freezedried meals are the lightest in weight and are recommended as essential items to be stored in your airplane for emergencies. In cold climates, you will need summer and winter paraphernalia that will need to be changed each season. If you have experience in trekking, backpacking, mountain climbing, hunting, and other outdoor activities you will already know what you need to pack away in your airplane for emergency layovers in the backcountry due to weather-related problems, aircraft failures, or aircraft accidents. The most important consideration is to keep the weight of your survival gear as light as possible by buying the lightest-weight items available and also to make sure you are not carrying unneeded items. In all my many days spent in the wild Alaskan outdoors in summer and winter, a tent is not only nice to have, it is a necessity. A light-weight and comfortable two-man tent can be found that weighs only five pounds. Every pilot needs to decide what to store away for emergencies. You know what you need to be comfortable. This will help tremendously in maintaining a positive attitude while grounded on forced layovers. It is important to schedule an excursion to stay overnight at a remote location and try out your equipment and food supplies. After the drill for an emergency layover, rearrange you survival kit and make it more efficient. A container should be used to pack small items so that they are not scattered throughout your cargo bin. Tie down the emergency container with straps so that it is not shifting and changing your airplane's center of gravity.

I highly recommend carrying a tool bag or kit in your airplane for use in making minor field repairs when necessary. This may keep you from being grounded far away from your home base where repairs can be easily made. My black zippered nylon tool bag (12” x 8” x 4” high) contains the following: spare spark plug and gas cap, screwdrivers, pliers (regular, long-nose, cutting), ratchet with 7/8 inch socket for removing spark plugs, crescent wrench, combination wrench set (1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, and 3/4”), several types of tape, safety wire, safety wire twisters, nylon fastening straps, nylon string, sewing kit with dental floss cord for mending torn fabric, Scotch-Brite, a packet of screws, washers, and nuts of various sizes, spark plug kit with dental picks for cleaning lead fouling in the bottom of plugs. The tool kit is for removing the cowling, taking out and cleaning fouled spark plugs, adjusting the carburetor, patching torn fabric, and other temporary repairs in the backcountry.

If your airplane is equipped with skis in winter, you’ll need an adequatesize snow shovel for digging your airplane out of the snow. The small backpacking shovels are too small and almost useless when you need to remove large amounts of snow. I use a lightweight full-size plastic snow shovel. Select your snowshoes carefully. Snowshoes with a small footprint are inefficient for packing down the snow for a takeoff or walking long distances across snow-covered terrain. Make sure the straps on your snowshoes are easy to put on and take off and designed to fasten properly so that they are not constantly slipping off your boots. In cold climates, a top quality warm sleeping bag is essential. Down sleeping bags are very warm and do well when the temperature is well below freezing. In warmer weather near or above freezing, synthetic insulation is a better choice as it will not absorb moisture and lose its insulating value. To increase warmth in your sleeping bag, carry a fleece liner (weighs two pounds). Place the fleece liner inside the sleeping bag, crawl in and zip it up around you—it is like a mini bag and provides a tremendous increase in warmth over just the sleeping bag.

Other important items to carry in your airplane are a first aid kit, compass, orange flagging material, and an ocean tide book. Extra-long nylon airplane tie down ropes are also essential to carry in your cargo bin. I carry a shovel for summer use. This is a three-piece lexan-bladed shovel with aluminum handles. It is a lightweight, extremely durable, and easy-to-assemble, practical, and useful shovel when needed to remove a hump or

fill in holes on a backcountry landing area. Another important recommendation is to carry an efficient ax. Hatchets are built with short handles that are almost useless (horrendous shock and inefficient when cutting firewood). I have a Gerber ax that has a total length of 18 inches. This is the smallest size ax that is efficient for cutting firewood. I also carry a folding cross-cut bladed saw for cutting brush on remote landing areas, fuel funnel, fuel tester, bicycle pump for inflating my Alaskan Bushwheels. The small light-weight bicycle pump works great as the tires only require about 6 to 8 psi of air.

Aircraft Tie-Downs in the Backcountry

Aircraft catalogs have numerous options for aircraft tie-downs. They offer corkscrews, triangular steel stakes, winding steel anchors and others. Corkscrews, 16 inches in length, are augered into the ground. Steel stakes, 14 inches in length, are driven into the ground with a maul. Driving stakes and anchors into gravel or stony substrate is next to impossible. In addition, on sand or gravel bars, these anchors would likely fail (pull out) in strong winds and provide no security for your airplane. I would not trust any of these toy tie-downs for my expensive airplane. I know of only one tie-down that is trustworthy—that is the duck bill. Once you drive a duck bill anchor into the ground, it is not coming out. The negative on duck bills is that once they are set in the ground, they can’t be taken out again. If you’re on a long backcountry trip, you’ll run out of space, weight, and funding for carrying enough duck bills for each overnight tie-down. A heavy steel implement and a mallet are required to drive the duck bill into the ground. This requires lots of space and extra weight to haul around.

I pondered the tie-down encumbrance for a few years and came up with a solution that beats all of the traditional tie-down options by a wide margin. When you land in remote places, look around where your aircraft is parked. Almost every time, you will find something in the natural environment that you can (with a rope) tie your aircraft down. Trees, logs, boulders, and willow or alder bushes all work extremely well. (Tie a rope around the base at ground level of the entire clump of willows or alder bushes and not around a single stem.) You may have to taxi your airplane for correct placement for the tie-down. Before I land (if I am spending the night), I’ll be looking for vegetation or logs where I can tie the airplane down. You’ll need to bring ropes that are longer than normal for tie-downs.

On a naked sandbar with no logs or willow bushes, I carry three heavy-duty plastic bags. These are not garbage bags, as they would be much too lightweight to hold a sack full of stones, cobbles, gravel, or sand. Use the plastic bags similar to the tough bags that cement comes in. You'll find these at hardware stores. Also, make sure the bags are large enough so that you can add sufficient weight to hold down your aircraft in a nasty windstorm. Fill the bags with natural materials with a shovel, dig a hole for each bag for the wing and tail tie-downs, drop the bags in the holes and backfill material around the sacks. My tie-down strategy has never once failed in my many years of flying and camping in the backcountry in Alaska, and my airplane is not cluttered with heavy insecure anchors.

One other item on tie-downs is to make sure your knots are properly tied. The aviation knot is highly used and recommended for tying down your aircraft. Your rope should be of high quality nylon and highly pliable as knots are difficult to tie securely and may become untied with stiff rope. Make sure the diameter and the strength (fades with age) of the rope is adequate. Learn to tie knots with the hand massaging the knot so that it can be fastened properly and tight enough so that it will not untie in strong, gusty winds that push and pull on the tie-down ropes. After tying the aviation knot, place a half-hitch on top of and another one below the knot for added safety. This will ensure your aviation knot will not come loose. It is amazing how many aircraft are tied down with a fast and quick pull of the rope forming a loose looped aviation knot. The knot is not tight and is likely to become untied in windy conditions. There are substantially more instances reported than you would expect with improperly tied-down aircraft coming loose and being destroyed in windstorms in Anchorage.

Alaskan Bushwheels

Alaskan bush pilots have always known the utility of larger and softer tires for backcountry landing operations. Many versions of the so called "tundra tire" were developed and manufactured in Alaska during the past fifty years. The early development phase of the legendary Alaskan Bushwheels was originated in the 1990s by Guy Selman from Antique Tire and Rubber and later by Jim Pazsint of Alaska Tire and Rubber Company. In 2000, Bill Duncan bought the Alaskan Tire and Rubber Company and moved it to Joseph, Oregon. The name was changed to Alaskan Bushwheels Incorporated. The Oregon company upgraded the tire-building technology,

rubber formulas, and tire construction. They now build tires that are of radial construction. They have FAA Supplemental Type Certificates (STCs) available for over 100 light aircraft.

No upgrade to an airplane used for backcountry operations will provide a greater benefit than Alaskan Bushwheels. This is so straightforward that little or no discussion is necessary. They are expensive but they are a must-have conversion for your airplane. The Alaskan Bushwheels provide increased ground clearance both for your airplane and for your propeller. They also provide a substantial amount of shock absorption when touching the ground on the landing roll. Increased propeller clearance will help to reduce the amount of rock particles the propeller picks up. This reduces chip damage to the leading edge of the propeller and other damage to the airplane such as holes knocked into the fabric on the undersides of the horizontal stabilizer and elevator. The Alaskan Bushwheels dissipate an enormous amount of kinetic energy when landing. This greatly reduces the shock on your landing gear and airframe of your airplane. It also provides for a much shorter landing roll as a large amount of kinetic energy is absorbed by the Bushwheels when they touch down on landing. This leaves much less kinetic energy to be dispelled by braking.

I knew that Bushwheels for backcountry landings were important but when I made the conversion from the hard 8.50-6 conventional tires to the larger and softer Bushwheels, I was shocked at the difference. Hard tires absorb very little kinetic energy when landing. This means you are always landing and rolling on the ground at greater speeds. This means longer and rougher landings. Your airplane will bounce more. Your landing gear and airframe absorb a greater amount of shock and are much easier to damage. All these deficiencies are much improved when using Bushwheels. The Bushwheels will allow landing on shorter and rougher landing surfaces in the backcountry. You will be landing in marginal areas that you would not even consider if you were using hard tires. All landings will be much safer with the Bushwheels, and the landing options will have increased two- or threefold. Most pilots would not consider flying into and landing in the backcountry without Bushwheels.

Ski Flying

Ski flying can be included as the most rewarding flying in Alaska; nevertheless, it is the most misunderstood and the most underappreciated

way of flying in Alaska. With all the taildraggers in Alaska, only a small number are operated on skis in winter. One Alaskan pilot even asked “Why would you land on a glacier?” This caught me by surprise. I answered that the vista was beautiful up there and said no more. Many pilots in Alaska fly only when there is a mission to complete. Traditional missions are using the airplane for hunting, fishing, trapping, flying to your remote cabin, and many other activities related to hauling cargo or people to remote areas. In my evaluation, many pilots don’t include the most important reason to own an airplane in Alaska; that is flying for the aesthetic value and inspiration.

Alaska has some of the most stunning landscapes on earth. Why not include this in your flying repertoire? What I mean by this is to contemplate getting airborne on a good-weather day only for the purpose of flying into the mountains, glaciers, and fjords and finding scenic landing places where you can take short hikes. Many of my flights are dedicated exclusively to this purpose. The inspiration is sensational and the life enhancement is off the charts. An airplane equipped with skis in winter opens up an entirely new paradise that rivals flying destinations with wheels and floats in summer.

Frozen lakes covered with winter snow are excellent places for ski landings. Mountainous terrain above tree line in places such as benches and ridges and mountain slopes are great landing places in winter. The vast marshes and wetland areas of Alaska that are impossible for wheel landings in summer provide excellent landing areas for ski-equipped aircraft in winter. For all the flying in Alaska, ski-equipped aircraft provide by far the most landing places. Ski-equipped aircraft are also necessary as a safety factor for winter flying in Alaska. Forced landings with wheels on snowcovered terrain result in virtually all airplanes nosing over and damaging the airplane when the wheels dig into the snow. For all the above reasons, ski flying in Alaska in winter is very rewarding, necessary, and should be part of a pilot’s flying operations in the northland.

Glacier landings are very special. They offer the only surface access into this stunning setting of flowing ice surrounded by awe-inspiring mountains and provide the most distinguished of all flying in Alaska. Excellent landing conditions throughout the winter are provided as the glacial ice aids in keeping the snow on the glacier’s surface consistent. Glaciers are only 30 minutes away from Merrill Field in the Chugach Mountains and there are hundreds of glaciers available for landings within

one hour’s flying time from Anchorage. Pilots land on glaciers in the Chugach Mountains from 2,000 feet above sea level to over 7,000 feet. Super Cub pilots land on a glacier at 10,000 feet near the summit of Mount Spurr, which is eighty miles west of Anchorage. The spectacular Harding and Sargent ice fields on the Kenai Peninsula are 80 miles south and southeast of Anchorage. Mount McKinley’s mammoth glaciers of ice in the Alaska Range are slightly over 100 air miles from Anchorage.

Pilots can fly over glaciers on wheels in summer and skis in winter. These flights at low level provide enchanting vistas of glaciers and mountainous landscapes. However, there is nothing quite comparable to landing and walking on a glacier on snowshoes or skis. This is truly an out-of-life event that cannot be experienced without being on the glacier in person. This great opportunity with ski-equipped airplanes should not be squandered.

Snow conditions in Alaska are misunderstood. For the most part snow provides the magical surface for many types of winter activities, for example, cross-country on snowmachines, skis, and snowshoes. Nevertheless, there are times and conditions when snow causes challenging and difficult ski landings. Snow conditions are highly variable and this variability can greatly degrade ski landings. Powder snow blown into waves by windstorms can cause enormous landing problems when snow later melts and then refreezes. The waves become hard, almost comparable to concrete. You often can’t land in such places without breaking your landing gear. Pilots flying on skis have to learn to drag the snow before each landing and determine whether the snow surface is suitable for landing.

One of the rewards of ski flying is that most landing places are quite long and rarely is there a problem with taking off with such distance available. Making use of your aircraft landing tracks for taking off makes the departure on snowpacks easier. Landing at high elevations in the mountains and glaciers usually is not a density altitude issue because the cold in winter counteracts this problem. Taking off on sloping terrain has a profound built-in efficiency. The distance required for takoff on a 20 percent slope is one half the distance compared to level ground. Sloping terrain can be found on many landing places and especially on glaciers.

Many pilots are apprehensive about falling into a crevasse when landing on glaciers. There is a real possibility of this happening. Nevertheless, it does not happen very often. I can’t recall the last time this happened;

possibly more than a decade ago. I have long-term experience traversing glaciers on skis when I was an active member of the Alpine Cub of Alaska in Fairbanks and the Mountaineering Club of Alaska in Anchorage. We were always roped up. I would not land an airplane on glaciers if I thought it had a high risk factor for falling into a crevasse. Many pilots don't realize that their winter boot heel print (20 pounds per square inch) has over 12 times more pounds per square inch than skis on their airplane (1.6 pounds per square inch). This means that a pilot walking on a glacier has a much greater chance of breaking through a snow bridge and falling into a crevasse than the airplane does. Always put on your snowshoes (2.2 pounds per square inch) or skis (2.3 pounds per square inch) before moving away from your airplane. This may lower the foot pounds pressure sufficiently to prevent collapsing a snow bridge and falling into a crevasse. This one important step could save your life. Pulling someone out of a crevasse is not a routine event; it is much more difficult and dangerous than most could imagine. If a pilot fell into a crevasse and had to be pulled out, it is highly doubtful he or she would be capable of flying his or her aircraft back home. This can cause much anxiety. In winter I usually carry the necessary equipment to extract a person from a crevasse—strap harness with leg loops, climbing rope, aluminum stakes, pulley, climbing ax, and Jumar ascenders.

The safest place to land an airplane on glaciers obviously is an area free of crevasses. Nevertheless, crevasses are not always easy to discern, especially after massive snowstorms have dumped large amounts of snow over the glacial surface. A pilot with experience of traveling many miles on glaciers on skis, can detect the areas where crevasses are most likely to be found with a flyover. However, landing in areas where crevasses are present often is not a problem after the large snowstorms in early winter dump massive amounts of snow on the glaciers. The snow fills in crevasses and the snow bridges become stable when winter temperatures drop in the teens and below in November and December. The glacier's snowpack remains stable throughout the coldest part of the winter; January through March. In May and June, because of warm sunny days, the snow bridges become weak and the greatest danger of falling into crevasses can happen. By this time most ski flying operations have ceased.

Air taxi operators from Talkeetna can land on glaciers near Mount McKinley later than in most other places. The pilots use several landing

sites they know are safe for landings late in the spring and into the summer. Climbers on Mount McKinley are flown into the Kahiltna Glacier at 7,200 feet in April, May, and early June. Sightseers are flown into the Ruth Glacier near the Sheldon Mountain House at 5,500 feet all summer and into August.

September is the best time to fly above glaciers and to observe the exposed glacial ice free of snow cover. This will reveal the vast areas on the glaciers where crevasses are found. You'll need to take pictures of these areas or at least remember where they are so you don't attempt to land there in winter when snow covers them up. You can also fly over your favorite winter landing places and verify that there are no crevasses in the locality. My greatest concern is falling into crevasses while moving across a glacier. It is always reassuring to know that there are no crevasses in the vicinity of the glacier that you are moving across.

Several types of wheel skis are used for winter operations in Alaska. Wheel skis are typically used by pilots who have an airport home base where the runways are plowed and free from snow. Hydraulic skis are rigged to raise and lower the wheels as needed at the airport and in the offairport setting. Wheel-penetration skis provide fixed wheels that protrude below the ski for landing on snowplowed runways. When landing in the snow, the wheel penetrates down below the ski and results in increased drag on landings and takeoffs. Tail skis are usually the wheel-penetration type with the fixed wheel protruding below the ski.

The other type of ski used in winter in Alaska is the straight ski. The main wheels are removed from the aircraft and the simple straight skis are placed on the wheel axles. This type of ski should not land on snowplowed runways. Merrill Field has two main paved runways (16–34 and 7–25) where the snow is plowed in winter. The third runway at Merrill Field is a 2,000-foot gravel strip (runway 5–23) that is left unplowed in winter. This is where all aircraft with straight skis park. Aircraft with straight skis at International Airport use the ice of Lake Spenard for landings, takeoffs, and parking.

There are three choices for the tail ski. You can use the tailwheel without any alterations. It will sink into the snow and cause drag that slows forward speed on takeoff. It will also sink into the snow on landings and shorten them, similar to light braking. The next option is to use a wheel penetration tail ski. This landing apparatus will slow down the aircraft on

landings and on takeoffs but not as much as the tailwheel without any alterations. The third option for a tail ski is the straight tail ski. The tail wheel is removed and the straight tail ski is installed for winter operations.

For small taildraggers (Taylorcraft, J-3 and PA-11 Cubs, Champion) and medium sized taildraggers (Super Cub, Piper PA-12, Citabria, Maule, Scout, and Arctic Tern), straight main skis and the tail ski with the tail wheel removed are by far the way to go. All types of wheel skis are very expensive, excessively heavy, create excessive aerodynamic drag, and are much less efficient when operating on snow surfaces than are straight skis. Straight skis have all the advantages with the exception that they cannot be used on airport runways that are plowed in winter and kept free of snow. If you have ever gotten your aircraft stuck in the snow and had to dig your way out and use snowshoes to pack down the snow to get off, you'll understand the nuisance of operating aircraft in winter with wheel skis. So that you don't get stuck, you'll have to greatly limit where you can land an aircraft on wheel skis. These places are lakes with bare ice or thin snowpack, old landing tracks than have been packed down and have refrozen and other snow-packed runways. With straight skis, you can go just about anywhere and land on the fresh snowpack and not get stuck. There are a few exceptions such as wet, sticky snow, loose snow that may have hollow sections that will collapse on the weight of one ski, and a few others.

When selecting a straight ski for your small or medium-sized taildragger, make certain that the skis have sufficient surface area (measured in square inches) for your type of aircraft. You'll regret having a smaller surface area on your skis than is required when you have difficulty taxiing and turning in deep powder snow and making takeoffs. This will limit where you can land, not as much as with wheel skis but still to a degree that is annoying. If your skis are just a bit undersized, you can improve performance of the skis by extending the plastic bottoms on both sides of the ski. If this is insufficient, you can buy a ski the next size larger than the one on your aircraft.

Skis for the heavier taildraggers such as the Cessna 180s and 185s, Beavers, and Otters are more problematic because of the larger weight of the aircraft. Most Cessna 180 and 185 pilots do not use skis on their aircraft in winter because of the high risk of getting the airplane stuck in the snow and the laborious task and time required digging it out. The pilots that do

fly skis on these heavier aircraft are very selective where they land. They will need to be carrying a full crew if any snowpack manhandling of the aircraft is required. A one man operation in a C185 will provide zero manhandling help.

Winter Operations

You would think that pilots in Alaska who fly in winter would all have hangars of some sort to shield their aircraft from the harsh low temperatures and snow from October to late April. This has never been the reality as bush pilots have always kept their airplanes right out in the cold environment and have developed techniques to deal with them. Only recently in the past five to ten years hangars have been built at many airports in Alaska. I think that the cost of building hangars was too high in the past and they were not considered because of it. At the present time, that doesn't seem to be a point of contention as all hangars seem to be purchased as soon as they are built. Still, many pilots cannot afford to purchase a hangar because of the enormous price.

Keeping your airplane tied down out in the open in winter requires welltailored nylon covers to keep horizontal surfaces free of snow and ice; for example, wing covers, tail covers for horizontal surfaces, windshield cover with extended area to cover top of fuselage, propeller cover, nose cone cover and a well-insulated cowling cover. There is so much more than just purchasing these covers and placing them on the aircraft. First, it is important to find a sewing specialist who has been doing this type of work for many years. (Linda Drummond from Alaska Wing Covers has been sewing quality aircraft covers for over 30 years. These are the best designed and are measured to precisely fit your aircraft.) It is also necessary to have the cover makers come out and measure your airplane surfaces so that the covers fit snugly. You don't want sagging covers that blow around and rip and become torn in strong winds. Waterproof nylon works well, especially when melting snow and ice conditions exists. This will keep water from accumulating on the surfaces underneath the covers that later turn to ice when the temperatures drop below freezing. Black color for the covers is necessary. This is simple physics; a "black body" absorbs and reradiates the most sunlight into long-wave heat rays that will melt the greatest amount of snow or ice on the covers. This helps to keep the covers free of snow and ice so that you don't have to manually remove it. This saves lots of time. It

has always amazed me to see the “black body” efficiency in vaporizing water or melting snow and ice on the covers in the middle of winter when low temperatures would appear to not allow this.

The above information on covers for your aircraft is my own recommendation after many years of learning. Certainly, other pilots have different ideas and their own way of selecting the covers they desire. You will have to talk to them to obtain this information. I always advise that a pilot should review information and in the end be creative and learn to select the choices that fit your own needs best. You are the only person who can make this decision because you are an individual with your own personal traits. This is like all aspects of being a pilot—learn to make decisions on your own. You can always change if you see something better. The learning experience will also be helpful. The important point here is to be creative and to learn to be comfortable with your own decision.

The next item on winter operations for an airplane tied down outside in the natural weather elements is the heating necessary to prevent damage from starting a cold-soaked engine. Multiviscosity oils (Shell 15W-50, Phillips 20W-50, Chevron 20W-50) are used in cold climates. These oils flow well even at zero degrees Fahrenheit. Warming the oil pan with an electric heat pad (100 watts) will keep the oil thin for better engine and cylinder lubrication and less of a problem for the battery in turning over the engine when starting. Nevertheless, heating the oil alone will not be sufficient to avoid damage to an engine in a cold start. The engine must be preheated inside the cowling when outside air temperatures are 20 to 30 degrees Fahrenheit and below. This will warm up the crankcase and the cylinders to operating temperatures that are safe for starting the engine. Cold starts can seriously damage an engine and must be avoided. The following paragraphs provide information on several methods to preheat a cold-soaked engine.

Tanis provides a multipoint electric preheating system for small airplanes. It consists of six 50-watt electric heating elements connected by a wiring harness. These units are permanently installed on the aircraft engine. The heating elements are screwed into the threaded CHT-probe bosses in each cylinder head. Another heating element (flat silicone rubber heating pad) is glued to the crankcase with high-temperature RTV. The sixth heating element is a second heating pad glued to the bottom of the oil pan. The wiring harness has an AC plug that can be connected to an electric cord.

Reiff also provides a preheat system designed for small airplanes. It uses 50-watt heating elements mounted on large stainless steel clamps that mount on the non-finned portion of each cylinder barrel. It also has an oil pan heating pad but not a crankcase heating pad. It depends on sufficient heat to the crankcase by conduction from the oil pan and cylinder heating elements.

Both the Tanis and Reiff preheating systems work well. However, they are costly to purchase and install. Pilots have developed other successful methods. If your airplane is being flown once or twice weekly, it is an advantage to keep it from getting cold-soaked. Keep the well-insulated engine cover over the cowling. Use an oil pan heating pad (100 watts) and one 100-watt electric bulb placed inside the cowling. These two heating elements are plugged in to an electric cord and left on at all times. Two hours prior to engine start-up, a third heater will need to be placed inside the cowling. This is usually a small (7”x 5 ½“x 1 ¾”) automotive heater (1,000 to 1,500 watts) with a circulating fan. The oil heating pad and the 100-watt light bulb will keep the cylinders warm and the seat heater running for two hours will provide sufficient heat to warm up the engine case. Check the cylinders and the crankcase to make sure they are warm to the touch prior to start-up. You can also look at the cylinder head temperatures if you have an engine analyzer installed. Other pilots use forced-air preheating units such as Herman-Nelson and Red Devil. Smaller forced-air heaters are fired by propane, kerosene, or gasoline.

Pilots will also need to carry in the airplane a preheating element that can be used in the backcountry where there is no electricity. A “heat box” of some sort is required to prevent hot air from a heater from being lost due to convection on windy days. Sheet metal shops can easily build a heat box that works well. It will need a hinged door in which a small camp stove or at least the stove burner can be placed inside. A 4-inch-diameter stovepipe or flexible aluminum tubing 4 to 6 feet long can be used to connect the heat box which is placed on the ground to the gap in the underside of the cowling that leads to the engine. Sporting goods stores have a multitude of camp stoves to choose from. The MSR multifuel stove has an advantage in that it can use aviation fuel from the aircraft.

Fuel contamination is very important to avoid. Water is the most likely contaminant. Standard recommendations are to keep the fuel tanks full when the aircraft is idle; this will help prevent condensation and water

developing in the tanks. Pilots need to intensively know their aircraft. Neither of my aircraft, the Piper Cub (15 years) and the Arctic Tern (15 years) have a water condensation problem. I leave my tanks near empty until I'm ready for a flight. It is very important not to overload your aircraft with fuel you don't need. I put in the tanks only the fuel that is needed with a small reserve for safety considerations for the day's flight. If your tanks have water condensation problems and you fill your tanks to the brim, then you'll have to drain fuel so that you are carrying only the amount that is necessary for the mission you are on. Water and contamination are so important that all fuel that goes in my aircraft is filtered with a fine mesh Mr. Funnel filter to retain water and other contaminating debris (sand, rust, bits of rubber and plastic particles) from entering the fuel tanks. In over thirty years of flying in Alaska not once have I had a fuel contamination problem.

Other Training Missions

Additional training will be needed besides what is covered in this book. That should not be too difficult as what has been covered in the book is a primer providing a basic understanding on how to train. It is the pilot's responsibility to be aware of training that is needed and to go out and get it done. Since self-training is the bush pilot way, the important consideration is to take responsibility, add it to your training list, talk to experienced pilots, read what is available, and incorporate it into your training schedule. As you fly and train, your confidence will build to the point that you will feel comfortable taking on new training challenges. You will also have utmost assurance that your self-training mission will improve your flying capabilities and make you a better pilot. There is nothing like knowing you are in control of your own destiny and that you have the confidence and diligence to get the job accomplished. Under these circumstances, you will excel in your essential flying capabilities that will make you an extraordinary pilot.

Aircraft Accidents in Alaska

The Air Safety Foundation of Aircraft Owners and Pilots Association (AOPA) analyzed aviation data and found a rate of 13.59 accidents per 100,000 flight hours in Alaska between 2004 and 2008. The comparative rate for smaller general aviation aircraft in the continental United States was 5.85 accidents per 100,000 flight hours. Alaska's aircraft accident rate was more than twice as high as the national average during these years. During this time frame, Alaska had 515 small airplane accidents making up 6 percent of the 8,010 accidents nationally in that period. By comparison, Alaska has 2 percent of the U S population. The National Transportation Safety Board's (NTSB) records show 252 people lost their lives in aviation accidents in the last 10 years in Alaska. That is 25 lives lost per year during the 2000s. The twelve-month period that ended on September 30, 2011 showed a total of 95 aircraft acccidents and 19 fatalities in Alaska.

Why is the aircraft accident rate so high in Alaska? One leading motive for this is that there are many pilots in Alaska with low numbers of flying hours. Low-time pilots do not have sufficient training and the skills needed to avoid routine accidents. They also will not build up sufficient flying time over the years to be improved pilots. The third encumbrance is that for all practical purposes, they are not proficient pilots as they fly too few hours with large gaps between flights. Many of these pilots buy an airplane for one specific purpose such as hunting or flying to a recreational cabin. They use it solely for that purpose and almost never fly the remainder of the year. It sits parked at the airfield. When these pilots are out participating in their mission, they encounter challenging flying situations including weather-related conditions that require much greater flying skills than they possess.

Other causes for the high aircraft accident rates in Alaska include the many pilots who own an airplane and decide they want to use it for offairport operations. Although we have the great bush pilots up here, it is amazing how many pilots do not train the bush pilot way. These pilots occasionally use an instructor who provides little of the skills needed for off-airport operations. These pilots have low skill levels and when they

encounter a challenging situation, by fluke, they are exonerated or more often they crash their airplanes.

Aircraft operations that cause many accidents in Alaska are off-airport landing approaches that are too fast and too high. Additional speed is the last thing you want when coming in for a landing. Remember that kinetic energy in your airplane increases with the velocity of the airplane squared. The equation for kinetic energy ($E = ½ MV^2$) shows the enormous boost that an increase in aircraft speed can cause in increasing the airplane's kinetic energy. All this energy must be dissipated before the airplane can come to a complete stop. You must always keep kinetic energy in your airplane at the lowest level possible. That will save your airplane and often your life. Instructors teach pilots to use the airplane's stall speed (Vso) with a 1.3 factor added for safety considerations. This is stall speed plus 30 percent. Instructors say fly that speed with 0 to 5 mph. A Super Cub has a Vso of 43 mph; add the 30 percent safety factor and the flying speed is increased to 56 mph. A pilot flying in at 2 mph over the safety factor speed would be coming in for a landing at 58 mph. This is 15 mph over the true stall speed of the aircraft (2 mph over Vso and the safety factor). When calculating the kinetic energy in a moving Super Cub with a speed of 43 mph and comparing that to 1.3 Vso plus 2 mph, (flying speed of 58 mph), notice that the energy generated has for all practical purposes doubled. This doubling of kinetic energy happens because the velocity of the aircraft is squared in the energy equation. Landing at almost twice the amount of kinetic energy would increase the stopping distance by 75 percent or more depending on how rough the landing surface is and how much the airplane bounces and floats as it lands. Bush pilots can't afford the longer stopping distance and do not want to energize the airplane with a huge amount of unnecessary energy. This makes off-airport landings much longer, difficult, and problematic. In bush flying, reducing the airspeed to the extreme minimum when landing is one of the most important procedures to master. Many aircraft accidents are caused by energized aircraft way beyond what is necessary for a safe landing. If you energize your airplane, it has the potential to get out of control and do horrendous damage. It is just the opposite when your airplane lands at low speeds. When landing at initial stall speed, the airplane does not have sufficient energy to get out of control and crash with a large amount of powerful force. The low landing speeds

are a genuine blessing in disguise. They are one of the most important bush pilot's Cardinal Rules.

Pilots who come in too high usually land a long ways down the landing area. This causes alarm and often go-arounds are attempted to abort the long landing because the remaining distance is too short to get the airplane stopped before running into rough areas. Pilots attempt way too many goarounds in Alaska, many of which do not succeed. In various situations, go-arounds are not possible and no attempts should be made to do them. It appears that this problem is exacerbated by instructors training pilots to make a go-around anytime they don't like what they are experiencing in a landing. It is taught as a panacea that solves all landing problems. In the past ten years, the number of retired Airline Transport Pilots (ATPs) flying Super Cubs into landing strips in remote areas in Alaska making this mistake is incredible. These accidents are all listed in the NTSB file.

Hazardous weather conditions in VFR flying are related to substantial numbers of aircraft accidents in Alaska. The conditions causing these problems are often low clouds and fog, powerful winds creating turbulence and wind shear, and intense rain and snowstorms. Inaccurate and missing weather reports can exacerbate the problem; however, it is the decision of the pilot that determines the outcome. The remote places in Alaska far from any civilization can also intensify the problem. In the end, there are too many pilots with inadequate experience flying difficult weather conditions and too many pilots making poor decisions for safe flying. This results in many accidents that are weather related.

Crosswind landings are another frequent cause of aircraft accidents in Alaska. It is amazing how many crosswind landing accidents happen on airports such at Merrill Field with towers and controllers. Accidents happen at crosswinds below 10 mph. They happen for two reasons. The airplane is coming in for a landing at excessive speed (loaded with kinetic energy) and the pilot is poorly trained for crosswind operations. Crosswind landings need to be practiced over and over again early in your flying career to prevent these easily avoidable crosswind accidents.

Carburetor icing causes aircraft accidents in Alaska, especially in summer on a cool day when there is high humidity in foggy weather. Pilots must know their airplanes; not all airplanes have problems with carb icing. My Piper Cub with the 0-200 Continental engine and the Arctic Tern with the 0-320 Lycoming engine do not have carb icing problems. I have

detected no carb icing problems in the Piper Cub in 15 years of flying and perhaps only one time in 15 years in the Arctic Tern. Therefore, I do not pull carburetor heat on landings during the summer months. Being practical, I do only what is necessary. Pulling carb heat in winter when the temperature is below zero degrees Fahrenheit helps to improve fuel vaporization. Therefore, carb heat is recommended under these conditions when coming in for a landing. Because fuel vaporization is hampered in low temperatures, it is also highly recommended not to come in for a landing on final approach with a closed throttle. Keep the throttle opened as appropriate until touchdown. Engines do stop running due to vaporization problems in cold winter weather.

If you are only instructor trained about carb icing, you'll not have sufficient knowledge to properly understand and handle carb icing problems. I had the advantage of flying the Beechcraft C23 Sundowner. This was a real learning experience concerning carb icing because this aircraft flying on a cool and high-humidity day in summer would almost always succumb to carb icing somewhere along the way. With so many carb icing occurrences, I learned how to immediately recognize the problem and how to promptly correct it. Without this training, I would not have decided to refrain from pulling carb heat on landing for my two privately owned aircraft.

Other problems causing aircraft accidents in Alaska are fuel starvation, oil pressure problems, ignition problems, flight control problems, and others. Much of the emergency knowledge learned in many cases is not extremely helpful in these situations. The most important consideration is that you are here with this problem. You and your tremendous innovative mind will have to take charge and figure out what the problem is. You will also have to figure out how to counter the problem and continue to fly or if absolutely necessary to land the aircraft. Attempting to figure out the problem often will require trial-and-error techniques. This is no different from what bush pilots go through on an extended self-training program. My experience reveals the amazing ability that the working mind has that can be of great help in solving these complex problems and also in relieving pilot stress.

Avoiding aircraft accidents is a very important consideration in making a decision to become a pilot. Individuals who want to be a pilot have to completely understand that being a reliable aviator takes a considerable

amount of time and preparedness in fully engaging yourself in the undertaking. There are no short cuts in the flying and training time necessary in becoming a proficient and safe pilot. All the odds are against you as a pilot if you do not fly a sufficient number of hours every week, every month, every year, and so on. Sooner or later, a low time pilot that has large flying gaps in which the airplane is not flown will likely wind up in an accident that will wreck the airplane and possibly cause injury or death to the pilot and others. This is a major consideration that many pass over lightly and don't give proper attention. If you want to be a successful pilot, it is essential that you fly as often as possible and that you work diligently at learning each and every time you go flying. The lesson to learn is that trustworthy pilots must have consistent and ample flying and training time so that they can evolve into a more improved pilot as time goes forward. If you don't have the time to fly on a consistent basis or think that flying and training time is not that important, my recommendation is that you do not become a pilot—the risk level for accidents is too high. Airplane engines that are not flown on a regular basis are also subject to being damaged—corrosion. This often leads to overhauling the engine hundreds of hours sooner than the estimated time before overhaul.

Cardinal Rules for Becoming the Best Pilot

The Cardinal Rules for becoming the best pilot have evolved over the years by bush pilots flying and training in Alaska. The rules have been fully demonstrated, tested, and proven to be highly effective by untold numbers of pilots. The techniques employed for following the rules are not difficult to learn and implement. The self-training required to follow these rules is not aircraft accident prone—it is certainly as safe as or even safer than the instructor-trained way. Following the Cardinal Rules will significantly enhance your flying skills and reduce your aircraft accident rate by a wide margin. Below are the Cardinal Rules that will make you the best pilot you can be.

Cardinal Rule Number 1. Self-Training. Read and talk to experienced pilots to learn as much as possible about flying your airplane. Set-up your own training program and schedule the training necessary to expand your training horizons. Your goal is to become your own self-reliant pilot.

Cardinal Rule Number 2. Precise Landings. Every landing must be precise. It must be on target and at the same time the wheels must touch down at initial stall speed. It is not acceptable to land your aircraft in a highly energized condition—this causes too many aircraft accidents. Always select a landing target where the wheels need to touchdown. Place the wheels, every time, in a symbolic rectangular box 60 feet wide and 20 feet deep. This is the Cardinal Rule that has helped the most in limiting me to zero accidents in 34 years of landing taildraggers in Alaska's wild backcountry. All pilots will be able to substantially reduce their landing accident rate to near zero by applying this Cardinal Rule. As a fledgling pilot, you may want to review this Cardinal Rule a second time—it is almost too good to be true. You can now start a new flying career without the fear of wrecking your airplane on landing operations. It will rarely if ever happen if you apply this Cardinal Rule.

Cardinal Rule Number 3. Flying on a Regular Basis. This is important in maintaining proficiency and at the same time to increase your total number of flying hours to continue your progression as an improving and competent pilot. If you cannot fly on a regular basis; it is important to consider whether it is sensible to continue being a pilot and flying airplanes. There are many other endeavors in life that will not end in a tragic aircraft accident. It comes down to how much risk you want to take.

Cardinal Rule Number 4. Flying by the Seat of Your Pants. As a pilot, you must have the feel for flying your airplane. This will allow you to fly your airplane and make takeoff and landing operations with the utmost precision. You will not need a manual or have to memorize numbers to fly by the seat of your pants. Seeing, feeling, and hearing what your airplane is telling you are easy to comprehend. All variables such as wind speed and direction has already been incorporated into your airplane. What you see, feel, and hear is absolutely accurate and it provides the most useful information while flying your aircraft.

Cardinal Rule Number 5. Situational Awareness. Always be attentive when flying. Notice what is going on around you at all times and think how changes will affect your flying capabilities. Make the changes that are necessary in a timely and orderly manner. Being situational aware will help you avoid many aircraft accidents as a pilot. The way it works is that you first have to be aware and then you can act as appropriate to keep your flying safe. You cannot improve your condition without first being aware!

Cardinal Rule Number 6. Learning to Master the Weather. Every pilot needs to understand the weather so that it does not become a major distracting and intimidating force. My way is to be your own weather forecaster as you fly your airplane. Other aviators will choose other ways to work through this highly difficult task. All pilots must have a workable plan that is useful and stress-free.

Cardinal Rule Number 7. Safe Crosswind and Gusty Wind Landings. Sufficient training is needed to master crosswind landings. Practice until you are knowledgeable and confident that you can perform acceptable crosswind landings. Don’t forget when flying on windy days, by being creative, you can often find a way to land into the wind and avoid making

crosswind landings. This is the safest way to handle crosswind landings (totally avoiding them) and this should be your first consideration. Gusty winds are involved in and contribute to a large number of aircraft landing accidents in Alaska. What usually makes gusty wind landings such a difficult task is that many pilots are coming in for landing with highly energized airplanes way above stall speed. This combination of landing in gusty winds and excessive speed is very problematic and often results in aircraft accidents. (This is one of the most perilous situations you could ever place your airplane in. The gusty winds are difficult enough to master without making it more difficult by increasing the kinetic energy in your airplane.) The landing accident rate under these conditions can be substantially reduced by landing at initial stall speed and by being highly observant of changes in wind conditions. When coming in for landing with the throttle closed, strong gusty winds that change in direction, a wind shear, or a lull in the wind can take control of your airplane and wreck it. The first sign of winds changing or attacking your airplane calls for immediate action. One important counter action to take is to open your throttle and allow the propeller to push air across the wings and tail surfaces. This usually provides a stable aircraft that can be controlled in gusty wind conditions. Proceed with a second landing attempt. A go around may be required if you are landing on a short strip and do not have sufficient space.

Cardinal Rule Number 8. Evaluating Off-Airport Landing Areas. Pilots must practice this airborne examination until they become highly proficient at selecting suitable landing areas from the airplane’s cockpit. This will provide reassurance for a safe landing experience in off-airport operations.

Cardinal Rule Number 9. Smart Braking for Off-Airport Landings. Many aircraft accidents in Alaska are caused by improper braking when landing in off-airport operations. An accident that happens over and over in Alaska is an airplane coming in for landing highly energized because the airspeed is way above stall speed. When the wheels touch down, the distressed pilot stomps hard on the brakes to slow down the runaway aircraft. This often results in the wheels of the airplane digging into soft terrain and flipping the airplane over upside down. When you learn how to make precise landings and touch down at initial stall speed, you will not

need heavy braking to stop your airplane. Any heavy braking needed should always be applied gradually. Never stomp on the brakes. The first sign of wheels digging in or the tail coming up requires the pilot to immediately release the brakes and reset them at a lower level. The throttle may also need to be applied under these conditions.

Cardinal Rule Number 10. Limit the Number of Go Arounds. NTSB reports during the past 10 years clearly show that go arounds are causing unacceptable numbers of aircraft accidents in Alaska. The concept of a go around is important as it provides an alternative option when landing your aircraft. This is useful; however, too many pilots use go arounds as a panacea or a way out for every flawed landing operation. (More times than you may think, successful go arounds are highly doubtful because they depend on problematical circumstances that are often not feasible.) Learning to make precise landings at initial stall speed is the way to limit the number of go arounds that are necessary. Once you learn to make precise landings with all of the excess kinetic energy taken out of your aircraft, rarely is there a need to make a go around. I am not ruling out touching your wheels on the ground to assess conditions of a landing place and then opening the throttle for lift off. This is a planned test landing operation—not a haphazard go around that happens spontaneously after a botched landing procedure. Rolling aircraft wheels over your landing area or dragging skis over snow-covered surfaces and becoming airborne has little or no danger of wrecking your airplane. Make certain that dragging a place for a test landing is always accomplished downhill on sloping terrain.

Take the Young Flying

When someone asks or whenever you get a chance, take a young person flying. This is a rare event for an individual at five to ten years old. The flight most likely is the first opportunity for them to climb into a small airplane, get airborne, and fly away. Over the years, I have taken my share flying in the Piper Cub and in the Arctic Tern. I remember taking one tiny boy who was only five years old. He needed two pads in the back seat to sit on so that he could see out the window. My fights are into the nearby Chugach Mountains six miles east of Merrill Field, across the glaciers, and showing them Alaska's magnificent wildlife along the way. I usually make several landings on short gravel bars in Lake George basin and along the Knik River so they can experience the taildragger's unique advantage of being capable of landing in miniscule places in the backcountry. Most of the ones I have flown were very quiet; however, they were highly excited and to a certain degree, stunned at this very unusual and first-time airborne experience. They don't talk very much at such an early age; however, the flight often makes a lasting impression for the lucky ones that get the chance to go on the flight.

I ran into a friend recently that I worked with in the 1980s and 1990s on the joint bases. I had not seen him in about 10 years. What he told me about his son was amazing and it surprised me. I had taken his son flying when he was about eight years old. He told me that his son graduated from the University of Alaska with a degree in aviation technology. He also has his pilot's license and now is working on an instrument rating. After that he wants to obtain a commercial rating. Eventually, he wants to be an airline transport pilot (ATP) but is not certain that he can obtain employment after paying for the high cost of all the ratings that are necessary. I mentioned that this is the "golden age" for ATPs. The next day, I mailed my friend a well-written article stating that the airline shortage is now and it is worldwide. (*"Airline pilots: Coming up Short", by Marc C. Lee, Plane&Pilot, October 2012). I also included a critique providing useful*

information on how to finance the expensive training ("Financing the Flying Dream" by Marc C. Lee, Plane&Pilot, July 2012).

This shows how one flight early on in a person's life can have a profound influence in guiding a person toward a professional career. I am overjoyed for making that flight and being a part of helping others find their way. Most of the youngsters you take flying will not become pilots; however, they will have a first-hand experience with flying in Alaska and will likely be advocates for aviation in Alaska.

Flying Wildlife Surveys in Alaska

The First Wildlife Surveys

I began flying aerial moose surveys in Alaska during the early 1970s on the Fort Richardson and Elmendorf military bases (seven miles northeast of downtown Anchorage) and upper Ship Creek in the Chugach Mountains. Army Huey helicopters were used to fly the first surveys. The area on the coastal plain and in the Chugach Mountains encompassed 90,000 acres. The surveys would be flown after snowstorms provided a complete snow cover. This was usually in November or early December. The daylight time interval became too short to complete the surveys after mid-December. The goal was to fly a complete coverage of the military reservations and upper Ship Creek, and cover all areas where moose are likely to be present. The survey required a composition count consisting of all moose (cows, calves, yearlings, and bulls). This provided useful data for determining the number of moose to harvest in the fall and winter hunts on the military reservations and in Ship Creek. For accuracy in the composition counts, we had to circle each moose found to pick up calves and other moose bedded down nearby. Without circling each moose observed, other moose would have been missed.

Accurate surveys demanded that a high percentage (above 80 percent) of the moose be found. In those days, our total number of observed moose for the 90,000 acres was about 450 to 480. This information was provided to the Alaska Department of Fish and Game (ADF&G). The bases worked with the ADF&G to determine the yearly moose-hunting quotas for these lands. Approximately 125 hunting permits were issued by ADF&G each year. In the mid to late 1970s, ADF&G required Super Cubs for flying the surveys. The Super Cub was the long-established wildlife survey airplane for ADF&G in Alaska. The Super Cub made much less noise than a helicopter. This greatly reduced the disturbance factor to wildlife. The Super Cub cost less to operate and could also make tighter circles around a moose than the Huey helicopter. ADF&G provided the Super Cubs and pilots to conduct the surveys. I continued as a biologist flying in the

backseat of the Super Cubs recording the moose data. My tenure on conducting annual moose surveys continued on the military reservations and upper Ship Creek for more than 20 consecutive years. In the early 1980s, I found that there was a need to fly additional surveys on the military reservations.

The military bases had both migratory and nonmigratory moose. The migratory moose would spend the late winter and early spring months on the coastal plain on the military bases and move to the Chugach Mountain slopes and into the upper Ship Creek watershed for the summer and early winter months. The nonmigratory moose were mostly found on the coastal plain but also on the mountain slopes and upper Ship Creek. They stayed the entire year on the coastal plain or in Ship Creek. I realized that we needed to fly surveys to determine the timing of the migration and the number of migrating moose. There was no funding for additional moose surveys. The surveys had no chance of ever being conducted. I decided that I would like to volunteer my services for this task.

This would be an excellent opportunity for me to begin learning how to fly wildlife surveys. I had already purchased a Piper Cub in 1979. This would be a new and challenging flying adventure. The surveys would have to be flown in my own aircraft and on my own time. The federal government would not likely approve the surveys as an official government-sponsored project so I never asked for permission. I would accomplish this mission on my own dime.

The traditional way of flying wildlife surveys in Alaska is having a pilot flying the airplane and a biologist recording the data. I don’t think flying wildlife surveys for me would ever have gotten off the ground if I had tried this approach. I decided that what was more realistic for me was to be a one-person operation. I would be the pilot and also the biologist recording the wildlife data. This is something that I could take responsibility for and a task that I could accomplish.

My initial moose surveys were made on the Chugach mountain slopes and upper Ship Creek in midwinter to determine the numbers of moose in their winter habitat. The flying time could be substantially reduced since these surveys were needed to determine the total moose present and not compositional data. This meant that it was not necessary to circle every moose.

From the very first survey, I really enjoyed the flying and using my airplane not for drilling holes in the sky but for performing a practical purpose. Flying the surveys was not difficult because it was pure pleasure; I enjoyed it so much. From conducting official moose surveys with ADF&G, I had learned all the nuances of flying the surveys. Being my own pilot with lots of time for contemplation, I also learned a lot as I continued to fly the moose surveys. The survey data collected were very useful and have been used for many years in managing the military reservations' moose herd.

Moose Surveys in the Piper Cub and the Arctic Tern

From these initial background surveys on the military bases, I progressively began conducting moose surveys in my Piper Cub and later (after 1997) in the Arctic Tern. I would complete several surveys every year from February through March to provide additional data on the military reservations' moose herd. After a few years, I started to venture out and began conducting moose surveys of wintering moose in other areas in Southcentral Alaska.

ADF&G conducts most of their surveys in November and December after the ground has a complete snow cover to obtain compositional data for managing moose herds in Alaska. Very few surveys are flown during midwinter when moose are on their wintering grounds. Not all moose in Alaska migrate to wintering grounds. Some moose migrate only when food availability is lacking and when the snowpack becomes deep enough to impede movement. Nevertheless, there are many traditional wintering grounds for moose in Alaska and I've always thought that these areas should be monitored. Since no one was conducting these surveys, I decided to fly them in my Piper Cub.

The first moose wintering area I was interested in surveying was the MacKenzie Dairy Farms 14 miles northwest of downtown Anchorage. The boreal forest in this area was never an important moose wintering area. However, the establishment of dairy farms in 1982 changed the environment. Thirty-one farms were established and 12,736 acres of boreal forest (spruce and hardwood trees) were cleared and planted in forage crops. After five years, many of the dairy farms became unprofitable and were abandoned. By the year 2000, approximately 55 percent or 7,075 acres of the farms had reverted back to early-successional deciduous vegetation because of the lack of cultivation. The early-succession birch, cottonwood,

aspen, and willow saplings have become exceptional moose habitat. Moose from as far away as 30 to 40 miles migrate here to take advantage of this bountiful food supply. The deeper the snowpack in Southcentral Alaska, the more moose migrate here for the winter.

It is surprising to find such large numbers of moose migrating to the MacKenzie Farms. A survey on February 26, 2000 showed an estimated population of 638 moose. Other surveys showed these results: 728 moose on February 18, 2001; 585 moose on February 2, 2002; 544 moose on December 31, 2004; and 644 moose on December 19, 2008. Three surveys conducted in one winter showed these results: 249 moose on November 15, 2008; 644 moose on December 19, 2008; and 493 moose on March 14, 2009. Approximately 20 aerial moose surveys (average of two surveys each winter) have been conducted at MacKenzie Farms during the years 2000 to 2010. Each survey covers the 7,075 acres of moose habitat and requires approximately 1.5 hours of flying time to complete.

There is a great lesson to be learned from MacKenzie about moose habitat management in Alaska. The large numbers of moose that migrate here annually are doing so through happenstance. There was never any intention of developing this area for wintering moose. It happened due to the failure of the original plan of developing a dairy farming area. The lesson to take away from this is that Alaska needs additional wintering areas similar to MacKenzie Farms. These areas are needed to boost moose populations depleted by hunter overharvesting of moose in Alaska. The primary limiting factor with increasing moose populations in Alaska is the lack of winter habitat. The State (ADF&G) could develop additional winter habitat areas for moose by vegetation manipulation (removing mature forest) that could duplicate the changes that were made at MacKenzie. If the State made this a primary goal; they should be more capable of making this happen than the chance happening at MacKenzie. That would be a revelation for Alaska. Maybe the State could then ease off on blaming wolves for depleted moose populations and killing so many of them.

Another moose wintering area that has been surveyed for the past 10 to 12 years is Big Lake. Big Lake is located 22 air miles north of downtown Anchorage. The surveys conducted here are in the area that burned in the Miller Reach fire in 1996 on the north and east sides of Big Lake. Hardwoods including birch, aspen, and willow have flourished since the fire and have produced an outstanding food source for wintering moose.

The biomass of these hardwood saplings have been increasing for the past 10 years. The survey area is divided into three segments, which are: (1) North and northeast of Big Lake comprising 14,720 acres; (2) Lucille Creek drainage with 7,040 acres; and (3) East and southeast of Big Lake with 10,240 acres. The three segments comprise 32,000 acres (50 square mile Sections). Surveys in the Big Lake area were flown one time each winter during the past 10 years beginning in 2001. Survey results showing the larger numbers of wintering moose include a population of 306 on February 23, 2002; 501 on November 7, 2003; 471 on February 8, 2008; and 533 on February 17, 2011. An all-time high number of moose were observed at Big Lake in 2013. The survey conducted on February 25, 2013 showed an estimated population of 956 moose.

The Miller Reach fire burned sufficiently hot in many of the areas near Big Lake to destroy part or all of the organic and duff layers which lie above the surface of the mineral soil. The exposed bare mineral soil provides excellent substrate for germination of hardwood seeds naturally broadcast by the wind. Five years after the burn, native early successional hardwood saplings were flourishing and producing excellent winter moose habitat. This was a human-induced fire and would never have been allowed to burn in this area because of the many scattered homes and recreational cabins. Nevertheless, this area was similar to MacKenzie in that it was not a prime wintering area for moose prior to the fire. Prescribed fires are another way to provide new winter habitat for moose. Prescribed burns on selective sites would also be a way to increase the moose populations in Alaska.

The third moose wintering area surveyed is the Palmer Hay Flats which is 7 miles southwest of Palmer, Alaska. This area has only marginal winter moose habitat; however, the area usually has the shallowest snowpack in Southcentral Alaska because of the strong southeast winds that frequently blow in winter from the Knik River. The wind sublimates the snow; the snow goes from a solid state to a gaseous state (water vapor). Winters with large snowstorms and deep snowpack will trigger moose to migrate here to avoid wasting so much energy moving in deep snow. Surveys were conducted here only in a few winters. Survey results include a population of 302 moose on February 21, 2000 and a population of 101 on February 9, 2002.

Trumpeter Swan Surveys

The Knik River was visited many times and used as my primary airplane off-airport training area beginning in summer 1979. I began noticing resident trumpeter swans that nested here, other trumpeters that summer in the area, and migrating trumpeters that passed through the area. I often wondered how the swans were able to bear the high disturbance levels from individuals using recreational all-terrain cycles, trucks, jeeps, and power boats (air boats and motor boats). I already knew that trumpeter swans, when they are on the ground, are more alarmed at the proximity of man than any other living creature. The Knik River is the recreational playground for riders of motorized vehicles not only from the Matanuska-Susitna Valley (Palmer and Wasilla) but also from Anchorage. The Knik River region accommodates the largest gathering of off-road vehicle riders in the State of Alaska. The hub for the recreational area is Butte, Alaska on the lower Knik River. Highway vehicles (many with trailers) park here in several large parking lots. Recreational vehicles are off-loaded and riders travel up and down the river valley from below the Knik River Bridge on the Old Glenn Highway to the terminus of Knik Glacier, a linear distance of over 25 miles.

I asked several waterfowl biologists working for USF&WS and ADF&G about the swans. I wanted to know if they were flying surveys to find out how the swans were surviving in the heavily used motorized environments. USF&WS told me they conducted complete censuses of trumpeter swan summer populations in Alaska beginning in 1968 and continuing in 1975. From 1975, the censuses were conducted on a five-year interval all the way to 2010. The swan population has shown a State wide increase in number in every survey since the first one in 1968. I asked about additional swan surveys in the Knik River and the Palmer Hay Flats to monitor this specific population of swans. I mentioned surveys for monitoring nesting swans and their broods of cygnets and the large number of migrating swans stopping in the Palmer, Alaska region during the spring and autumn periods. They said since the Alaska State trumpeter swan population is increasing, they did not perceive any need to fly additional surveys. They had more important wildlife obligations elsewhere in Alaska. ADF&G’s reply about monitoring the swans was the same.

I could never agree that swan surveys in the Palmer region are not needed. They need to be flown to obtain a better understanding of the interaction of human recreational activities with the nesting and staging

swans in the region. There needs to be a balance between recreational use and the wildlife that resides here. The surveys will help to provide answers to these concerns. I decided that if the responsible agencies would not fly the surveys that I would fly them in my own airplane and on my own time. My federal government work was taking up fifty hours per week and provided little time to devote to flying swan surveys as often as they were needed. However, I would accept a slow process of gradually, over many years, collecting useful information on the swans.

The surveys were also a great learning adventure as I went along. I learned what data were important to collect and how to conduct the surveys. I retired from my federal government employment in 2004 and in the years after retirement I had more time to spend on the surveys. Surveys on the trumpeter swans were flown for over 20 years; however, the highestquality data were collected during the period from 2008 through 2012 when the surveys were flown in a more comprehensive manner.

Swan data for each flight were recorded in a notebook during the surveys. These data for each survey were later used in the preparation of written memoranda on my home computer. The memoranda were used as base documentation to write three swan papers for publication. Two of my swan papers were presented at the Twenty-Second Conference of The Trumpeter Swan Society held in Polson, Montana on October 13, 2011. These two papers will later be published in *North American Swans*, Special Edition, the Proceedings and Papers of the Twenty-Second Swan Society Conference. This is a bulletin of The Trumpeter Swan Society, Plymouth, Minnesota. A copy of my third swan paper was provided to John Cornely, executive director of The Trumpeter Swan Society. He will review the paper and decide whether to publish it in the proceedings.

The three swan papers comprise 31 pages including nine tables. The focus of the three papers is as follows: The first paper is on the status of the swans in the Palmer, Alaska region; the second paper is on the staging strategies of the swans; and the third paper is on swan disturbance levels. These three swan papers are being disseminated to State and Federal agencies and other interested organizations and individuals in Alaska. My goal now, through public outreach, is to enlighten Alaskans on the aerial swan surveys, the swan papers, and the need for reducing the high swan disturbance level in the Palmer, Alaska region. A balance between public motorized recreation and wildlife use in the region is being sought out. This

requires managing swan disturbance by regulating human activities that are negatively affecting the swans. This can be accomplished by amending the Knik River Public Use Area Management Plan and revising the Palmer Hay Flats State Game Refuge Management Plan with policies to mitigate swan disturbance. After policies have been enacted in the management plans to reduce the impacts on the swans, it will also be necessary to educate the hunting and recreational users concerning swan disturbance. Recreational operators are entitled to use public lands but must be educated about wildlife behavior and the need to respect wildlife.

Beginning in the summer of 2009 and continuing through 2012, I have conducted aerial trumpeter swan surveys in the Susitna coastal marshlands west of Anchorage, Alaska. The survey area includes the Cook Inlet coastal marsh (1 to 2 miles inland from salt water) from Point MacKenzie (Junction of Cook Inlet and Knik Arm) west to the Susitna River and southwest to the Beluga River and including the Susitna River delta north to Flat Horn Lake and Susitna Station. The survey area is entirely within the borders of the Susitna Flats State Game Refuge and the coverage encompasses the important swan nesting areas in the 301,947 acre refuge. The swans nesting and summering in the Susitna coastal marshlands provide a useful comparison to the swans in the Palmer, Alaska region as the Susitna coastal swans inhabit remote lands with negligible infrastructure and with little to no human disturbance during the summer months. There are no roads and limited motorized human disturbances. Airplanes and occasional motorboats are the only intrusions into these lands and disturbance levels are light to nonexistent. The nesting swans in the Palmer, Alaska region average ten pairs per year and the nesting pairs in the Susitna coastal region average fifteen pairs. A paper will be written in the future to compare the nesting and summering swans in the two areas.

Dall Sheep and Mountain Goat Surveys

Dall sheep are Alaska’s mountain monarchs that are found only in Northwest Canada and Alaska. Flying surveys to obtain population evaluations of these marvelous white sheep means flying into some of the most scenic alpine terrain in Alaska. Sheep surveys were conducted throughout the 1980s and 1990s. Areas surveyed were in the Chugach Mountains east and northeast of Anchorage including the Lake George

Basin and the following watersheds: Knik River, Eklutna River, Peters Creek, Eagle River, Ship Creek, and Turnagain Arm of Cook Inlet.

A Dall sheep survey was conducted on September 7, 1998, in the mountainous portion of Ship Creek, 10 miles east of downtown Anchorage. The number of Dall sheep observed was 184. This survey was not flown to capture composition data which would include tallying the number of rams, ewes, and lambs. It was an efficient survey to capture the total population of sheep in the Ship Creek drainage. A Dall sheep survey in the early 1980s found slightly over 300 sheep in Ship Creek. This is a large number of sheep for a drainage with a length of only 25 miles. A few years later the sheep population in Ship Creek was greatly reduced due to starvation—thick snowpacks covering winter food resources. In recent years the sheep population still has not recovered to the 1980s level.

A Dall sheep survey on October 28, 2005 found 225 sheep on the southfacing slopes of the Chugach Mountain range north of the Knik River drainage. The area covered was on the west side of the Jim Creek Basin Lakes on the lower Knik River and proceeded east along the mountains to Grasshopper Valley north of the Knik Glacier. Mountain goats were found in two areas on the east side of Metal Creek. Eleven goats were found west of Grasshopper Valley and three goats were found in the Glacier Fork Canyon east of Metal Creek.

A wildlife survey into the Eklutna River drainage on May 22, 2008 showed 95 Dall sheep, 72 mountain goats, 12 black bears and 1 brown bear. This was a very special day in which a variety of Alaska's most magnificent wildlife was found on a single flight into the Eklutna River Valley. This river valley is in Chugach State Park and is only 25 miles northeast of Merrill Field in downtown Anchorage.

Mountain goat surveys were conducted in the 1980s and 1990s in the Lake and Glacier Forks of the Knik River, Lake George Basin at the head of the Knik River, Eklutna River, Eagle River, and Bird Creek. Mountain goats often have escape cover nearby with the steepest and most rugged rock faces imaginable. Mountain goats have summer and winter habitats. The goats seek a cool environment in summers high in the mountains near the top of the glaciers and winter on steep south-facing slopes with the least amount of snow cover.

Bald Eagle Surveys

Bald Eagle surveys on the military bases northeast of Anchorage were completed in 1998, 2000, 2004, 2005, 2011, and 2012 to locate nesting pairs. Protection and management of bald eagles are mandated by the Eagle Protection Act of 1940 and the Migratory Bird Treaty Act of 1918. Surveys consistently found 6 to 8 pairs of nesting eagles each year. Bald eagles nest in cottonwood trees.

Brown Bear Surveys

Bears inhabit primarily the northern hemisphere. Alaska is one of the prime destinations in the world if you are interested in bears. Alaska has all three species of bears found in North America—brown, black, and polar bears. The number of bears in Alaska is exceedingly high for such enormous size predators. The polar bear found in the Chukchi and Beaufort Seas off coastal northwestern and northern Alaska are among the largest terrestrial carnivores in the world, rivaled only by the coastal brown bears in southern Alaska. The Alaskan coastal brown bears that gorge on salmon in summer are the largest of all brown bears living on earth. Alaska also has the smaller brown bear found in central and northern Alaska, often referred to as the grizzly bear. One important reason Alaska is so attractive to many people is that this is the “Land of the Bears”—magnificent animals found in stunning landscapes.

State and federal agencies in Alaska do not conduct aerial surveys to capture compositional data on bears. The reason for this is that survey data cannot demonstrate a measure of statistical reliability. In other words, it will not be possible to numerically duplicate the results that you have obtained. I can understand this reasoning as it certainly is the best way to obtain field data. However; if you cannot obtain data that can be duplicated, there must be a way to obtain data that are less reliable than desired, but data that have a value. It always seems to me that most wildlife data collected have value. This is what I tried to accomplish by conducting my own improvised black and brown bear surveys.

My initial brown bear surveys conducted in the 1980s and early 1990s had limited value as there was no method or guide for determining composition data, and ultimately the density or total population of bears in the area surveyed. Individual bears were not classified as to age and sex. Repeat surveys in the same area could not distinguish between bears on one survey versus bears on successive surveys. All this has changed with the

excellent video presentation prepared by biologists from the ADF&G and the Yukon Territory in Canada. The video tape “Bear ID, Take a Closer Look” was produced by Yukon Renewable Resources in 1990. From reviewing the tape several times and applying the lessons learned when locating brown bears on aerial flights, the author has learned to identify individual brown bears with a high level of precision. With this new skill, bear composition data can be collected on multiple flights on different calendar dates into the same area. The data can be useful in determining the total population of brown bears in a defined area.

My first attempt to try this technique of identifying each brown bear sighted was in the coastal areas of Trading and Redoubt Bays along the west side of Cook Inlet 75 miles southwest of Anchorage. Bears show up here in large numbers in late June and remain here until mid-July when they retreat to the mountains. A bear biologist from ADF&G told me that the bears came to the coastal areas in these bays to pick up salmon. My surveys clearly showed the bears were not feeding on salmon but were feasting on the tender sedges that grow here. The spatial distribution of bears on the western side of Cook Inlet on July 1, 2000 showed that predominantly sows with cubs were using the coastal habitat in Trading Bay (12,000 acres surveyed). All bears observed here were sows with cubs with the exception of one adult found south of McArthur River. The bears observed in Redoubt Bay (20,000 acres surveyed) showed a more uniform composition. Their numbers were doubled the number of bears found in Trading Bay. A total of 46 brown bears were found in these two bays—15 bears in Trading Bay and 31 bears in Redoubt Bay. One conclusion that should be drawn from this survey is that there is a sufficiently large number of bears using this habitat to establish it as a “Keystone Habitat” for the brown bears of Trading and Redoubt Bays. Active management to protect the habitat and the bears while they are present should be a goal of the land manager.

Inventorying brown bears in most habitats is difficult or impractical because brush or forest cover prevents the detection of a sufficient number of bears to provide accurate data. The coastal wetlands of Trading and Redoubt Bays provide an exceptional opportunity to gather composition data on a large number of bears in midsummer because of excellent survey conditions. Surveys under these conditions result in observing a large percentage of the bears. The aerial surveys can be very efficient and one survey covering the 32,000 acres can be flown in about two hours’ flying

time. The surveys could provide the most comprehensive data for brown bears inhabiting these two areas and could possibly provide reliable trend data—multiple surveys over several years. This would be representative of a large number of the brown bear population between the coastal areas and the mountains. These data could be used to properly manage the coastal brown bears in this region.

Identifying each brown bear on this survey by sex and age and using physical characteristics to distinguish between adults, subadults, and sows with cubs was much easier than expected because the bears were in the open on sedge-covered terrain where they could be easily evaluated. My next effort to try this technique for estimating the total population of brown bears was in upper Ship Creek which is 10 to 12 miles east of downtown Anchorage. I have made many flights into Ship Creek in the 1980s and 1990s to search for brown bears. Although Ship Creek appears to have a high density of brown bears; you are not likely to find very many on any one survey. Multiple surveys are needed in a summer to collect sufficient data to accurately estimate the bears that inhabit Ship Creek.

In the summer of 2000 I conducted more than a dozen aerial surveys into Ship Creek to locate brown bears. Sex and age and their physical characteristics were identified so individual bears throughout the summer could be used to estimate the total population of brown bears in the Ship Creek drainage. The total number of individual brown bears observed in Ship Creek in the summer of 2000 was 13. A conservative estimate of the number of brown bears in Ship Creek based on observing 13 individual bears in the summer of 2000 would be a total of 15 to 20 bears. The high density of brown bears in this watershed would indicate that this is prime habitat with excellent food resources for the bears. ADF&G reviewed my results but did not support the data collected because it did not have statistical reliability. Nevertheless, the survey results did inspire ADF&G to begin a radio-collar study of brown bears in Ship Creek. This was the first attempt by ADF&G to monitor the brown bears in the Ship Creek watershed.

Black Bear Surveys

The military bases have a large population of black bears often observed on aerial flights in summer. I have always aspired to conduct aerial surveys in an attempt to accurately estimate the total population. After learning how

to identify individual brown bears, I thought this technique could be duplicated on black bears. In 2003, I tried this method of identifying black bears on Fort Richardson.

Twenty-two aerial surveys were conducted primarily on Fort Richardson. A total of 35 black bears were observed on Fort Richardson and in adjacent Ship Creek. Of the 35 black bears observed, 28 were on Fort Richardson, six were in Ship Creek and one was observed on Elmendorf AFB. From identifying all individual black bears, it was astonishing how few repeat sightings were made in 2003. The minimum number of black bears observed on Fort Richardson in 2003 was 25. The projected or estimated population for Fort Richardson black bears was calculated by using a conservative correction factor (CF) of 30 percent added to the survey results of 25 bears. Calculations show the projected or estimated population on Fort Richardson to be 33 black bears in 2003. Dave Bostick attempted to estimate the black bear population for the two military bases in 1997 and came out with a total population of 38 to 50 bears. The latter represents a close comparison to my numbers on Fort Richardson, considering that mine are for Fort Richardson only. Neither of these two studies have statistical reliability. Nevertheless, they do show reliability when making a comparison between the numbers that have been reported. I do think both of these studies provide very useful information. Prior to these black bear surveys and estimations, no data were available.

Other Wildlife Surveys

A few other types of wildlife surveys have been flown in Alaska beside the principal ones discussed above. Many waterfowl surveys were conducted to obtain approximate numbers of geese, ducks, and swans (trumpeter and tundra swans) using the Eagle River Flats on Fort Richardson as a staging area in the autumn. A few attempts were made to fly aerial surveys in the Palmer Hay Flats and the farmers' fields south of Palmer, Alaska to determine the spring numbers of migrating waterfowl in this region. Waterfowl peak numbers in the spring can be in the thousands of geese and ducks. I remember observing a large number of snow geese on April 25, 2012 with several large clusters within a two-square-mile area near Duck Lake in the Palmer Hay Flats. The estimated number was 6,000 to 8,000. With this many waterfowl, you would have to count the geese in groups of 50 or even 100; like 100, 200, 300, 400, and so forth. You might

think that this type of counting waterfowl is wildly inaccurate. It turns out to be a lot more accurate than anyone would expect. To check on your accuracy, count the same cluster of geese several times and observe the numbers each time. You can also compare the total geese counted with aerial images. The images will give you great accuracy. The image can be printed on your computer. With a pencil, you can draw a circle around 15 to 20 geese. Continue with the circles until the whole cluster is included in the small circles. Then count and write the correct number of geese in each circle. Use a calculator to sum up the entire population of geese in the cluster. This will provide close to 100 percent accuracy if you don't make mistakes counting the number of geese in each circle and with summing up the totals. Recount each cluster several times until you obtain the same number.

Surveys that were inordinately difficult were several Beluga whale surveys that I attempted in Turnagain Arm (south of Fire Island), Knik Arm (mouth of Eagle River), and upper Cook Inlet near the mouths of the Beluga, Little Susitna, and Susitna Rivers. Beluga whales always seem to be traveling in large pods and in a certain direction. As they move along they continually swim underwater most of the time. However, they appear to have a routine sequence of surfacing after covering a set distance. I don't know the distance or if each whale has a different sequence for surfacing. All that I know is that you can't see the whales when they are swimming underwater. The only time they can be observed is when they surface and that is only for ten seconds or less. It appears that about one third of the whales in a pod are surfacing at any one time. This makes attempting to accomplish complete counts of the whales close to impossible. After a few surveys, I gave up on the Beluga whales.

Aerial Wolf Observations

Wolves are one of North America's most iconic native wildlife species. They are keystone predators that have an enormous capacity to create and maintain a well-balanced ecosystem. Wolves were reintroduced into Yellowstone National Park in 1995 and 1996. Recent studies in Yellowstone have found the effect of wolves cascades down throughout the park's ecosystems. Grizzly bears, black bears, wolverine, coyotes, foxes, martens, bald eagles, golden eagles, magpies, and jays benefit because they feed on carcasses of animals killed by wolves. These scavengers depend on the wolf for their primary food supply. The coyote population declines as wolves chase down and kill them in their territory. This increases the small rodent population in the park, which helps to increase the declining food supply for birds of prey and other small mammals that depend on rodents for their primary food source. Elk changed their behavior by staying out of the streambed habitats for most of the time to avoid wolf predation. This allowed willow, aspen, and cottonwood regrowth in streambed habitats where it had been almost wiped out. This, in turn, has provided abundant food that was lacking for beavers and nesting habitat for songbirds. Without the wolf acting as top predator, the ecosystem becomes unhealthy and out of balance with all species of plants and animals suffering from extreme conditions. The wolf has been eliminated from most of its native habitat throughout the continental United States by federally mandated poisoning programs. The wolf in Alaska, although it is continually being reduced in number by State predator control programs to increase prey populations, still runs wild in most areas in remote Alaska. The wolf is the largest member of the canine family and Alaska's gray wolf is the largest of its species found throughout the world. North American gray wolves weigh from 40 to over 140 pounds with females weighing slightly less than males. Wolves in northwestern Canada and Alaska tend to be larger with males reaching 140 or more pounds. The heaviest wolf on record weighed 175 pounds and was killed in the Fortymile Region of Alaska in 1939. Wolves are not monitored and

population censuses are not conducted by aerial surveys in Alaska because of the difficulty of locating wolf packs. ADF&G does place radio collars on wolves to monitor a few packs.

I have not conducted wolf surveys as such in Alaska; nevertheless, I have often taken advantage of monitoring wolves when observed in flying other missions. This is especially the situation when I find wolves participating in rare and interesting activities. One noteworthy occurrence took place in the 1980s when I was flying over the Davis Range on the south part of Fort Richardson. This was in early summer, late in the evening with low twilight. I saw a lone adult wolf chasing a moose calf. The cow moose responded by racing toward the wolf and chasing it away momentarily. I decided that I would circle these animals at a sufficient elevation that they would not detect the airplane and see what was going to happen. This was a cat-and-mouse game as the wolf hung around the cow moose and calf looking for an opportunity to run in and separate the calf from its protective mother and chase after it. I circled for a long time, perhaps fifteen minutes, and saw several encounters where the wolf chased the calf away from its mother; however, each time the cow moose would come barreling down the wolf's rear end and chase it away. Now, I was watching the cow moose chasing after the wolf one more time. By this time the cow moose was tired of this predatory action by the wolf and wanted to end the harassment. She looked awfully angry and determined to stop the wolf threats on her calf. What the cow moose did next was astonishing. This time she did not end the chase but kept coming full steam ahead. I wondered what the wolf would do now that it was in serious trouble. Finally, the wolf decided it had to find a safe haven to prevent a disaster. The wolf dove into a large alder bush with a dense array of many closely spaced branches that were perhaps 4 inches in diameter. It crawled and maneuvered its way into the center of the alder bush, which was about 12 feet from the outside branches. The wolf lay down there. I thought it was all over and that the cow moose would retreat and go home. The cow moose did not blink or turn around but pushed her way between the large and strong branches of the alder until she had reached the center where the wolf lay. As soon as she reached the wolf, she reared up on her hind legs and began stomping on the wolf with her front legs similar to a boxer punching his opponent. It was incredible to observe how hard and in what a rapid succession she was stomping on the wolf. The stomping went on for a long

time, maybe sixty seconds. Finally, the cow moose stopped the brutal attack and went back to her calf. The wolf appeared to be seriously injured with many broken bones and would die there in the alder bush.

The wolf lay still in the center of the alder bush for almost five minutes. Then surprisingly, it struggled to stand and slowly worked its way out of the alder bush. It walked very slowly and was limping and swaying from side to side as it walked. It was severely injured and it likely would not survive the encounter with the moose. The most amazing action noted was the moose pushing the strong alder branches apart to move into the center of the bush where the wolf lay. I did not think this was possible (the wolf also thought it had a safe haven) but the cow moose proved both of us wrong. This was a lucky day for the moose calf and a horrible day for the wolf. It was a rare event and I was fortunate to be able to watch it play out.

Another incredible event with wolves took place in the late summer and fall of 1997. One of the most interesting events with wolves is finding a den site. I can’t believe how lucky I was to find a wolf den this year. I found it while flying over the Davis Range on Fort Richardson only two miles east of Muldoon (east Anchorage) late one day on September 8, 1997. This was certainly a rare finding and I knew that I might not have the opportunity to monitor another wolf den site in the future, so I would take full advantage of this one. Although this den site could have easily been located (by walking to the site) and the wolves observed from the ground, I decided that I would probably disturb the pack and they would move on. I did not want this to happen. Monitoring the den site and the wolf pack from the air in my airplane would be the best possible approach of observing the wolves while not disturbing them from their daily activities.

At 7:05 PM, while flying between Bunker Hill and the Chugach Mountain slopes, I spotted a large adult wolf lying on the grass with outstretched legs. The big wolf was in the bottom of a glacier kettle that had steep sides rising to about 120 feet in a circular pattern. I made several more passes and all were sufficiently high so as not to disturb the wolf. It appeared that the wolf might be dead. However, the next pass revealed that the wolf’s legs had shifted from pointing east to now pointing west. I became really excited. This wolf was exquisitely colored with bright silver on its belly and lower legs, dark gray mottling color on its side, and very dark gray streaks on its back. Its midsection on the top of its back had a smattering of silver guard hairs. The wolf was very large and probably

weighed over 110 pounds. It was particularly long. Its tail was a very large dark gray plume pulled out from its body and lying on the grass.

At 7:10 PM I noticed several small black objects in the grass in the bottom of a second kettle 200 yards to the north of the one where the adult wolf lay sleeping. The black objects appeared to be black bears from a distance but on closer inspection, they could clearly be identified as four wolf pups playing in the grass. The adult wolf identified was most likely the alpha male sleeping in peace a short distance from his playful pups. On another pass over the north kettle, I located the alpha female wolf, solid black in color, lying down and resting in the bottom of the kettle about 50 feet from the pups. I monitored the wolves in both kettles for another ten minutes and always at elevations sufficiently high and horizontally away from the kettles so as not to alert them and alter their behavior. The alpha male wolf never got up while I was circling the kettles. The frisky pups continued to play, chasing one another. They were clearly visible as their solid black bodies contrasted strikingly with the straw-colored grass background. The alpha female changed positions several times while I was flying over north kettle; however, she did not get up and move toward the pups.

Observing the comfort level of the wolves with their four black pups playing in the bottom of a kettle gave me assurance that the den site was nearby. The next few flights provided wolf sightings that helped to pinpoint the den site. It appeared to be on a ridge to the west of the north kettle. This same ridge top was where the wolves rendezvoused each evening at twilight. From my initial finding of the wolves, it appeared that my best opportunity of finding them on each future flight was to fly at twilight. This worked exceedingly well. I made 15 flights over the den site from September 8 through November 30 and found wolves on 12 of the 15 flights. I did not always find all of the pack on each flight although some of the pack was present. I did not fly directly over the pack but around them so as not to disturb them. Each flight terminated when it got too dark to see the wolves. At that time, I would return to Merrill Field which was 6 miles away (four minutes' flying time).

A good look at the alpha female wolf in bright light showed that she had a dark black coat of hair with sparkling tiny silver speckles over her back. The most striking colors you could ever imagine. It was magical to be able to follow this wolf pack even though I was working full time. I would

attempt to fly as often as I could after work as this was a once-in-a-lifetime event. Weather conditions with low clouds and fog or turbulent winds prevented flying on some days. It would be difficult to describe how interesting and satisfying it was to find the wolf pack so many times and to observe the wolf family interacting with each other, sitting down like sentinels as they were preparing for the night patrol, or lying stretched out in a deep slumber. I looked for these wolves in subsequent years but they were not to be found near the two glacial kettles.

We are fortunate to have magnificent wild animals in our presence close to a large urban population for so many to enjoy. We certainly are blessed. We don’t have to encounter the wolves but only knowing that they are there so close by is a great feeling of richness and well-being. This is a uniquely Alaskan experience and we have an obligation to do our best to help these animals remain free from strife. The wolves already have a tough life and don’t need human-induced calamity. This will greatly impede the wolf’s arduous task of providing food for all the scavengers it feeds and balancing the animal and plant ecosystem in which they live their fascinating lives. Let the wolves be wolves.ß

Part II: Compendium Of Images

1. Arctic Tern on the beach in McCarty Fjord. (July 12, 2006)
2. Bull Moose in Anchorage, Alaska. (October 15, 2010)
3. Brown Bear in Yentna River Valley. (June 18, 2009)
4. Merlin at Merrill Field. (September 12, 2006)
5. Super Cub on sand bar in Lake George Basin. (October 3, 2012)
6. Wrecked Aeronca Sedan in the Knik River. (May 3, 2007)
7. A flight into the Chugach Mountains. (August 6, 2006)
8. Glaciers in the Chugach Mountains. (July 10, 2012)
9. Chugach Mountain Barrier near Harriman Fjord. (July 20, 2012)
10. McCarty Fjord on south coast of Kenai Peninsula. (July 12, 2006)
11. Airplanes at May Day Fly-In in Valdez, Alaska. (May 9, 2010)
12. Nylon covers on my Arctic Tern. (February 23, 2013)
13. Heat box and stove for warming aircraft engine. (January 5, 2010)
14. Ski-equipped aircraft on Little Susitna Mountain. (February 18, 2007)
15. Ski landings on top of Eagle Glacier. (March 25, 2007)
16. The Thomas Training Center on Eagle Glacier. (March 18, 2013)
17. Pointed mountain peak near Eagle Glacier. (March 30, 2010)
18. On the top of Harding Ice Field. (January 23, 2010)
19. Pete with Super Cub on Spencer Glacier. (March 3, 2007)
20. Kenai Mountains near Spencer Glacier. (February 23, 2008)
21. Pilots skiing on frozen Spencer Lake. (March 13, 2011)
22. Extraordinary bush pilot on Lake George Glacier. (March 11, 2007)
23. Ski-equipped airplanes on Kahiltna Glacier. (March 21, 2010)
24. Arctic Tern with Mount Hunter in background. (March 21, 2010)
25. Steep mountains on west side of the Ruth Glacier. (March 21, 2010)
26. Sheldon Mountain House Ridge. (April 3, 2012)
27. Sheldon Mountain House. (April 2, 2013)
28. Ski landing on the Willow Hills. (March 28, 2007)
29. Iditarod sled dog musher on the Yentna River. (March 3, 2013)
30. Dog musher passing through a cluster of airplanes. (March 3, 2013)
31. Piper 12 on a small island in the Knik River. (September 11, 2005)

32. Sean and the author in the Ruth Amphitheater. (March 21, 2010)

My Arctic Tern taildragger on the black sand beach in McCarty Fjord along the southern coast of the Kenai Peninsula. The purpose for this book is to help young pilots improve their skills and proficiency so they can safely land taildraggers on remote beaches like this. (July 12, 2006)

Bull Moose strolling through east Anchorage. (October 15, 2000)

One of Alaska’s renowned brown bears from the Yentna River area northwest of Anchorage, Alaska. (June 18, 2009)

We even have magnificent wildlife at Merrill Field. Here is a Merlin (small falcon) that shows up here each summer flying the grassy fields looking for a meal—rodents and birds. (September 12, 2006)

A yellow Super Cub on a sand bar near the terminus of Lake George Glacier. A self-trained pilot can increase learning and proficiency to make this type of landing and takeoff. The landing area is a soft sand bar that is only 175 feet in length. A precise landing and takeoff is required—no room for error. (October 3, 2012)

The first flight for this rebuilt and recovered Aeronca Sedan ended in an upside down airplane in the Knik River. I hope this book will help pilots to avoid this type of preventable accident—coming in for a landing too fast with the airplane abundantly overloaded with kinetic energy. (May 3, 2007)

Flying attractive mountain terrain 12 air miles southeast of Merrill Field in downtown Anchorage, Alaska in early August on a late evening flight. (August 6, 2006)

Further into the Chugach Mountains, 50-miles east of Merrill Field are mammoth glaciers and snow-covered mountain peaks at 10,000 feet above sea level (ASL). Many prominent mountain peaks in Alaska like these remain unnamed. (July 10, 2012)

The Chugach Mountain Range shown here creates a formidable barrier over 6,000 feet separating western Prince William Sound from the Knik River drainage. The Cascade Glacier on the left calves into Harriman Fjord. (July 20, 2012)

The Kenai Peninsula coastline is 120 miles south of Merrill Field. Here is McCarty Fjord with the stunning snow-capped Kenai Mountains which rise to 7,000 feet ASL. (July 12, 2006)

Airplanes at Pioneer Field for the May Day Fly-In and Airshow. More than 200 airplanes made it to Valdez for this year's event. (May 9, 2010)

Nylon covers on the Arctic Tern at Merrill Field. Note the sculptured wing and fuselage covers. This prevents the wind from bellowing the covers. The cover over the cowling has to be wellinsulated. Insulated covers are also necessary for the propeller and nose cone. (February 23, 2013)

This displays a winter engine heating system with a sheet metal firebox and a 4” diameter piece of stainless steel stovepipe. MSR stove burner is placed inside the firebox and the door is fastened. The red fuel bottle is outside the firebox. Stovepipe fits into the gap between the engine cowling and the aircraft’s firewall. The black insulated cowling cover retains engine heat. This heating system is carried in my airplane in winter and used where electricity is not available. (January 5, 2010)

Taildragger ski landings on the top of Little Susitna Mountain 45 miles northwest of Merrill Field. The landing elevation is 3,100 feet ASL. The ambient temperature is 10 degrees Fahrenheit. Big Susitna Mountain is in the background. (February 18, 2007)

Ski landings on the top of Eagle Glacier 30 miles southeast of Merrill Field. The elevation is 5,800 feet ASL. The snow is deep powder. We descended in powder snow 2 feet with boots. Our snowshoes sank only 6 to 8 inches. Unnamed mountain peaks on the horizon. The ambient temperature is 20 degrees Fahrenheit. (March 25, 2007)

The Thomas Training Center is the black-colored building shown on the top of Eagle Glacier at 5,800 feet. Alaska Pacific University's Nordic Ski Center trains America's top Nordic skiers on Eagle Glacier during the summer months. (March 18, 2013)

Many beautiful snow-covered mountains can be found near Eagle Glacier. Here is a uniquely pointed peak on the east side of Eagle Glacier. The peak is unnamed; however, it has an attractive sculpture (shape and form). (March 30, 2010)

Ski landing on the massive Harding Ice Field 80 miles south of Merrill Field on the Kenai Peninsula. The elevation of the landing site is 5,600 feet ASL. The ambient temperature is 25 degrees Fahrenheit. View is northeast. (January 23, 2010)

Pete and his Super Cub on a sunny day at Spencer Glacier 52 miles southeast of Merrill Field. The elevation of the landing site is 5,000 feet ASL. Ambient temperature is 10 degrees Fahrenheit. Carpathian Peak at 6,000 feet is shown above Pete's head. (March 3, 2007)

The mountains on the Kenai Peninsula have multitudes of attractive snow covered peaks. Many places on the Kenai Peninsula receive several hundred inches of snow each winter. Here is one of these snowy mountains approximately 15 miles south of Whittier, Alaska. (February 23, 2008)

Pilots cross country skiing near terminus of Spencer Glacier. (March 13, 2011)

Dee Deoudes, one of Alaska's extraordinary bush pilots, walking in ski tracts behind his white and blue Piper 12 taildragger on the top of Lake George Glacier. Elevation is 4,600 feet ASL. Lake George Glacier is 40 miles east of Merrill Field and 6 miles west of Harriman Fjord in Prince William Sound. (March 11, 2007)

This image shows Sean, on snowshoes, walking toward our airplanes on the Kahiltna Glacier at 7,200 feet. This is Mount McKinley's traditional Base Camp for climbing the mountain. Mount Foraker (17,400 feet) is shown in the background. (March 21, 2010)

The author’s airplane at the Mount McKinley Base Camp on the Kahiltna Glacier. Mount Hunter rises to 14,580 feet in the background. (March 21, 2010)

The Great Gorge of Ruth Glacier is lined on both sides with gigantic granite peaks. This image shows the mountain peaks on the west side when departing Ruth Amphitheater. (March 21, 2010)

This shows the snow-covered mountain ridges in the Ruth Amphitheater where the Sheldon Mountain House is located. The Mountain House is on the higher elevation ridge in the rear. The Mountain House is on the left and the toilet structure is on the right. Three cross country skiers can be seen on the trail to the right of the ridge. Airplanes with skis land on Ruth Glacier to the left side of the ridge. (April 3, 2012)

This is the legendary hexagon-shaped Sheldon Mountain House on a snow-covered ridge at 6,100 feet in the Ruth Amphitheater. The Mountain House can be rented and it is a popular destination for Mount McKinley enthusiasts from around the world. The Mountain House visitors arrive by ski-equipped air taxi airplanes from Talkeetna, Alaska. (April 2, 2013)

Cross country skiing in the Willow Hills 50 miles north of Merrill Field. (March 28, 2007)

The Iditarod Trail Sled Dog Race begins in Anchorage the first Saturday in March each year. I fly 40 air miles northwest from Merrill Field on Sunday and land on the frozen Yentna River to watch the dog mushers as they come through here on their restart from Willow, Alaska. This image shows Lance Mackey from Fairbanks, Alaska with his 2013 team of 16 hard working dogs. Lance came in first in the Iditarod race in 2007, 2008, 2009, and 2010. (March 3, 2013)

A large number of pilots land their ski-equipped aircraft on the Yentna River on Sunday to view the Iditarod dog mushers as they go by. Here is a dog team (lower right) about to pass through the middle of a cluster of 14 parked airplanes. Tents near shoreline show some of the pilots spent the night here. (March 3, 2013)

When pilots learn to be extraordinary pilots they will perform routine landings where other pilots would not dare. Here is one of those extraordinary Alaskan bush pilots practicing landing and taking off on a small sand bar surrounded by water in the lower Knik River near Palmer, Alaska. The airplane has already landed (notice the wheel marks on the sand bar) and now is set for the takeoff. From the position of the aircraft, the pilot has 250 feet of sand bar forward for takeoff. This takes the utmost— not only in pilot skills and proficiency but in self-confidence. (September 11, 2005)

Pilot Sean Sylvester (left) and the author standing on the ridge where the Don Sheldon Mountain House is built on a pleasant March day. The Ruth Amphitheater is in the background. Our airplanes are parked on the Ruth Glacier at 5,800 feet ASL. (March 21, 2010)

Part III: Memoranda

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2. Location of Anchorage, Alaska
3. Gannett's Pronouncement of Coastal Alaska
4. Alaska's Calling Card
5. May Day Fly-In (Valdez, Alaska)
6. Flying to Mount Marcus Baker
7. Ski Landing—Mount McKinley Base Camp
8. Ski Landing—Harding Ice Field
9. Ski Landing—Revisit to McKinley
10. Ski Landing—Spencer Glacier
11. Ski Landing—Return to McKinley
12. Ski Landing—Root Canal Glacier
13. Ski Flying Knowledge and Techniques
14. Ski Flying on a Cold Winter Day
15. Cross Country Skiing—Willow Hills
16. Safety when Moving on Glaciers
17. Density Altitude Chart for Ski Flying
18. Whiteout and Flat Light
19. Atypical Pilots Flying Taildraggers in Alaska
20. Flying Technique for Landing on a Gravel Strip
21. Building Quality Airstrips in Alaska
22. Whittier Airport Proposed Closure
23. Aviation Experience for Young Pilots
24. Arctic Tern Advocate
25. The Chilled Wolf and the Rambunctious Wolverine
26. Wolf Sightings on Fort Richardson
27. Wildlife Legacy of Ship Creek
28. Wildlife Sighted in the Chugach Mountains
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30. Moose Survey in the Ship Creek Watershed
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MEMORANDUM 1

SUBJECT: Flying in Alaska

January 15, 2013

1. A recent census recorded 722,718 people living in Alaska. More than half of Alaska's residents live in and around Anchorage and the Matanuska-Susitna Valley (Palmer and Wasilla). Alaska Department of Transportation and Public Facilities reported 4,857 miles of paved roads in Alaska in 2009. Many of the remote communities in Alaska are not connected to the road system. Due to the scarcity of highway infrastructure and the vast distances across Alaska, aviation serves as a major transportation link. There are 700 airports and more than 3,000 airstrips in Alaska primarily for commercial use. Bush pilots access remote areas in Alaska without airports and landing strips, by landing in natural terrain.

2. The best flying environment is right here in Alaska. There is no place where the terrain, which includes mountains, glaciers, and fjords, is more spectacular. See *Prophetic Pronouncement of Coastal Alaska* by Henry Gannett, written in 1904. The glacier-covered Chugach Mountains and Prince William Sound are located east of Anchorage. Lying to the north of Anchorage is the arcing 450-mile-long Alaska Range with Mount McKinley, its centerpiece, at 20,320 feet above sea level, 130 air miles to the north–northwest. To the south of Anchorage across Turnagain Arm of Cook Inlet is the awe-inspiring Kenai Peninsula with its spectacular glaciers, snow-clad mountains, saltwater fjords, the Harding and Sargent ice fields, the world-famous salmon runs in the Kenai River and the halibut capital of the world in Homer, Alaska. All this magnificent and incomparable wild country is accessible by small aircraft from Anchorage. Alaskan pilots traditionally fly into this wild country without human infrastructure and land their taildraggers.

3. Alaska has some of the best flying weather with long daylight hours (20 hours or more) in the summer months. Although the mountains in Alaska reach high elevations, the valleys are usually low in elevation. The days are cool in summer, and cold in winter. This makes for excellent flying weather

with great lift in summer when the day temperatures are in the 50s and 60s Fahrenheit. This contrasts with the high temperatures (from 80 to over 100 degrees Fahrenheit) and miserable flying conditions (greatly reduced lift) in the Lower 48 states in the summer months. Alaska can have extreme windstorms (Chinooks, Williwaws, and others), clouds forming low ceilings, fog banks, huge snowstorms, extremely low temperatures in winter (minus 20 to minus 80 degrees Fahrenheit), and other serious weather problems that can be real challenging when flying. However, there are ample good weather and satisfactory flying conditions for many days in Alaska in both the summer and winter months.

4. The snowpack in Alaska in winter provides first-rate conditions for skiflying operations. Many pilots change out their landing gear from wheels to skis after the first snowstorms establish a stable snowpack suitable for landing ski-equipped airplanes. Ski flying with sufficient snowpack runs from December to the first part of April—over 4 months. Ski flying in winter provides by far the most landing places compared with wheels or floats in summer. The summer landing places on wheels are suitable for winter landings on skis. Frozen lakes that are snow-covered in winter provide excellent landing places for ski-equipped airplanes. Glaciers covered with a deep snowpack also provide excellent landing areas on skis. Many places in the mountains where wheel landings are not suitable in summer offer excellent conditions for landing in winter on skis. Examples are benches, saddles, valley bottoms, and plateaus above tree line. Airplanes equipped with skis in a forced landing are much safer than wheel-equipped airplanes, as they can be safely landed almost anywhere on the snowpack. Wheeled-equipped airplanes in forced landings will almost certainly flip over when landing on the snowpack.

5. Many pilots use airplanes for access to their privately owned cabins located in remote areas within 100 miles of Anchorage. These cabins are used primarily for recreation, hunting, and fishing. Most of these cabins are not road accessible and the airplane provides the primary conveyance. These cabins are scattered in every direction from Anchorage. Large numbers of cabins are found in the Susitna River basin that lies north–northwest of Anchorage. It is a mammoth-sized boreal forest (spruce and hardwoods) that is mostly uninhabited with the exception of the Parks

Highway, which bisects it in a north–south orientation. The Susitna River basin has hundreds of lakes that are accessible with floatplanes in summer and ski-equipped airplanes in winter on the ice-covered lakes. The basin is 125 miles north–south and 75 miles wide at its widest part—over 3 million acres. There are many cabins on the northwestern part of the Kenai Peninsula, which has over 4,000 lakes. Many other cabins are found in Redoubt and Trading Bays, which are located on the northwestern side of upper Cook Inlet.

6. Flying wildlife surveys in Alaska is another very rewarding experience with the scenic landscapes and the magnificent wildlife. Surveys are traditionally flown to obtain population and composition data for moose, caribou, Dall sheep, mountain goats, and waterfowl. Alaska Department of Fish and Game hires many pilots throughout Alaska to complete the surveys.

7. Many other pilots in Alaska with commercial licenses fly passengers and cargo to remote villages and other places in Alaska. There are many air taxi positions in Alaska to fulfill this need. Other commercial opportunities in Alaska are flying charter flights for sightseeing tours and dropping off passengers in remote areas for fishing, hunting, bear viewing, rafting, kayaking, backpacking, and other outdoor adventures.

8. The camaraderie of flying in Alaska is the best a pilot could possibly find anywhere. This is because of the large number of skilled pilots to learn from and talk to about flying in new and exciting places. Flying to places already traveled will offer exciting new experiences as the weather and the wildlife sighted are never the same as the previous fly-in. Flying with experienced pilots can be a rewarding and safe experience.

MEMORANDUM 2

SUBJECT: Location of Anchorage in Relationship to the Mountains, Glaciers, and Fjords

January 14, 2013

1. Anchorage lies on a coastal plain near sea level on upper Cook Inlet at the western end of the Chugach Mountain Range. The Chugach Mountains extends eastward from Anchorage for 250 miles along the north side of Prince William Sound. The mountain range stretches inland from salt water for 50 miles or more. It is magnificent mountain, glacier, and fjord country with no human infrastructure with the exception of the Richardson Highway, which bisects the Chugach Range from Valdez north through Thompson Pass. Apart from the Richardson Highway, the remaining portion of the Chugach Range is pristine wilderness with mountains, mammoth glaciers, and ice fields.

2. South of Anchorage across Turnagain Arm of Cook Inlet is the Kenai Peninsula (6,424,320 acres) with the massive Harding and Sargent ice fields. The glacier-clad Kenai Mountains on the eastern and southern twothirds of the Kenai Peninsula have a large number of glaciers facing the Gulf of Alaska. These mountains receive several hundred inches of snow annually. The snow feeds the glaciers and ice fields. Kenai Fjords National Park (669,000 acres) is along the southern coastline of the Kenai Peninsula southwest of Seward, Alaska. The Kenai National Wildlife Refuge includes almost 2 million acres along the western portion of the Kenai Peninsula while the Chugach National Forest on the eastern portion of the peninsula includes slightly over 1 million acres.

3. Fifty miles northeast of Anchorage are the Talkeetna Mountains. This is a range of mountains with small glaciers near the highest mountain peaks, which are about 8,000 feet. Eighty miles west of Anchorage is the southern end of the 450-mile long Alaska Range. Mount Gerdine (12,600 feet) and Mount Spurr (11,070 feet) are the highest mountains in this part of the Alaska Range. Massive glaciers surround these mountain peaks. Mount

Spurr is an active volcano, 80 miles west of Anchorage, which last erupted in August 1992. The first eruption struck at 2 PM. The light passed from daylight to twilight (almost dark) in one hour. A thick cloud of ash completely covered Anchorage with one to two inches of the volcanic material. I collected an ash sample and placed it in a jar for safekeeping. The ash color is dark grey. Mount Redoubt is another volcano 60 miles south of Mount Spurr in the Alaska Range. Mount Redoubt had massive eruptions in 1989–1990 and again in March 2009. Its ash color is tan or light brown.

4. Mount McKinley at 20,320 feet above sea level is the only mountain in North America that is over 20,000 feet. It is located in the central part of the Alaska Mountain Range 130 air miles north, northwest of Anchorage. Massive glaciers flow off this mammoth mountain. The largest glaciers are the Kahiltna (45 miles in length); Ruth (38 miles); Eldridge (29 miles); Muldrow (27 miles); Dall (22 miles); Lacuna (22 miles); and the Tokositna (21 miles). The widest of these glaciers (rivers of ice) range from 1.8 to 3.6 miles; the ice thickness can be several thousand feet. The elevation of the terminus of the Kahiltna Glacier is less than 1,000 feet above sea level. The top of the Kahiltna Glacier is 10,000 feet at Kahiltna Pass—an elevation gain over 9,000 feet. Private aircraft are allowed to land in Denali National Park on wheels, floats, and skis. Ski-equipped aircraft can land on all popular glacier landing sites including the Mount McKinley mountain climbing base camp on Kahiltna Glacier at 7,200 feet and the Sheldon Mountain House in Ruth Amphitheater at 6,100 feet.

MEMORANDUM 3

SUBJECT: Gannett's Prophetic Pronouncement of Coastal Alaska

January 12, 2013

Anchorage is located in Southcentral Alaska along the upper part of Cook Inlet. The city lies directly below the western slopes of the Chugach Mountain Range. The coastal mountain ranges in Alaska, including the Chugach, were chronicled by Henry Gannett, an early pioneer of geography and topography in the United States. He became chief geographer of the US Geological Survey in 1882, three years after its creation. A stunning mountain in the Chugach Range with a permanent snow cone was named after him. Mount Gannett is 58 miles east of Anchorage near the lower part of Knik Glacier. The peak's elevation is 10,000 feet and its base on the north side is 1,400 feet, giving it a topographic prominence of 8,600 feet. Henry Gannett's *Prophetic Pronouncement of Coastal Alaska* was brilliantly written in 1904. His vision into the future is amazing. Gannett's pronouncement follows.

"There are glaciers, mountains, fjords elsewhere, but nowhere else on earth is there such abundance and magnificence of mountain, fjord, and glacier country. For a thousand miles the coast is a continuous panorama. For the one Yosemite of California, Alaska has hundreds. The mountains and glaciers of the Cascade Range are duplicated and a thousand fold exceeded in Alaska. The Alaska coast is to become the showplace of the entire world, and pilgrims, not only from America, but from far beyond the seas, will throng in endless procession to see it. Its grandeur is more valuable than gold or fish or timber, for it will never be exhausted. This value measured by direct returns in money from tourists will be enormous; measured in health and pleasure it will be incalculable."

MEMORANDUM 4

SUBJECT: Alaska's Calling Card

January 10, 2013

1. Alaska has extraordinary bush pilots and at the same time it has so much more to attract people to the Great Land. Alaska is the "Land of the Giants." With a mammoth size of 663,267 square miles, Alaska is larger than many countries in the world—larger than Norway, Sweden, Germany, France, Spain, Iran, Pakistan, Egypt, Kenya, Tanzania, Venezuela, Peru, Bolivia, and Chile. Alaska is one-sixth the size of the Lower 48 and has 33,904 miles of coastline, more than all of the contiguous United States combined. It is estimated that there are approximately 100,000 glaciers in Alaska with more than 600 that are named. The Bering Glacier and its adjoining Bagley Ice Field is the largest and longest glacier (114 miles in length) in continental North America and is the largest temperate glacier system in the world. The Hubbard Glacier is the largest tidewater glacier in North America reaching 76 miles in length. The Malaspina Glacier in Alaska is the world's largest Piedmont glacier. It is 40 miles wide and 28 miles long with an area of 1,500 square miles (the size of Rhode Island).

2. Mount McKinley at 20,320 feet is the highest mountain in North America. It is part of the 450-mile Alaska Range, one of the 39 mountain ranges in Alaska. McKinley is not the only big mountain in Alaska. The Wrangell–St. Elias Mountain National Park and Preserve has 9 of the 16 highest mountain peaks in the country. Mount St. Elias at 18,008 is the nation's second-tallest mountain. Other mountains are Mount Bona (16,421 feet); Mount Blackburn (16,390 feet) and Mount Stanford (16,237 feet). Mount Hunter, between Mount McKinley and Mount Foraker (17,400 feet), is higher in elevation at 14,573 feet than Mount Whitney (14,495 feet), the highest mountain in the Lower 48 states.

3. Moose are the world's largest member of the deer family and the Alaskan moose (*Alces alces gigas*) is the largest of all moose (bull moose in Alaska weigh from 1,000 to 1,600 pounds). Moose inhabit northern forests in North America, Europe, and Asia (Russia). In Europe, they are called elk.

Alaska’s coastal brown bears also grow larger here than in any other area in the world. Mature males in Alaska average 1,058 to 1,175 pounds over the course of the year with the largest bears weighing up to 1,600 pounds after gorging on salmon during the summer months. When standing upright on its hind legs, a large male will reach a height of over 10 feet. These bears share the title with the polar bears as the largest landbased predator in the world. Alaska’s polar bears are off the northwest and northern coasts (Chukchi and Beaufort Seas). They live on the ice and feed on seals. The largest polar bears weigh up to an astounding 1,700 pounds, slightly heavier than the brown bear.

4. Alaska has over 30,000 miles of coastline, over 3,000 rivers, and more than 3 million natural lakes (lakes that are over 20 acres in size). This provides for the most prolific salmon habitat in the world. Every summer, millions of adult salmon that feed in the Gulf of Alaska and the Bering Sea return to Alaska’s rivers for spawning and rearing their young. Alaska’s giant king salmon is the state’s fish. The largest king salmon ever caught weighed 126 pounds. It was caught in a fish wheel near Petersburg, Alaska in 1949. The largest sport-caught king salmon was 97 pounds and 4 ounces. It was caught by Les Anderson in the world-famous Kenai River in 1985. The largest red salmon also comes from the fabled Kenai River. The red salmon world record was 15 pounds and 3 ounces and was caught by angler Stan Roach on August 9, 1987. The world’s most abundant source of wild native rainbow trout and steelhead are found in Southeast Alaska westward along the Gulf of Alaska to Bristol Bay in Southwest Alaska. These wilderness fisheries are as unique as they are prolific. The Alaska Department of Fish and Game gives trophy certificates for anglers taking rainbows that meet the minimum weight standard, which is over 15 pounds. The largest rainbows in Alaska exceed 20 pounds in weight.

5. Alaska’s diverse and magnificent wildlife not only includes the largest moose, brown bear, polar bear, gray wolf, king, and red salmon, but also has the largest gathering of bald eagles (several thousand) north of Haines, Alaska and more than half of the world’s population of humpback whales. Bowhead and beluga whales summer in the Bering, Chukchi, and Beaufort Seas. A small population of beluga whales (284) is found in Cook Inlet and frequently can be observed from aircraft flying over Turnagain and Knik

Arms of upper Cook Inlet near Anchorage, Alaska. Blue, finback, sperm, killer, and other whales are found in the Bering Sea and the Gulf of Alaska. Walrus and many seal species are found in the Bering, Chukchi, and Beaufort Seas. Other large land mammals found in Alaska include the bison, black bear, mountain goat, Dall sheep and caribou. The caribou are distributed in 32 herds totaling approximately 950,000 animals. The western Arctic caribou herd is the largest with an estimated 348,000 animals in 2009. Smaller mammals in Alaska include the wolverine, gray wolf, coyote, lynx, Arctic fox, red fox, beaver, fisher, marten, mink, red squirrel, northern-flying squirrel, ermine, least weasel, and small rodents.

6. The birdlife in Alaska is also a top attraction. The list of known avian taxa in Alaska in 2012 includes 493 naturally occurring species in 64 families and 20 orders. This checklist includes birds common to Alaska as well as species that are rare (occurring annually), casual (not annually but at irregular intervals), and accidental (one or two Alaska records). Alaska is a haven for waterfowl as half of its land is wetlands. Alaska's waterfowl include 2 species of swans, 5 species of geese and 27 species of ducks. The annual migration of waterfowl flying to Alaska in the spring and departing in the autumn includes 120,000 swans, 1 million geese, and 10 to 12 million ducks.

7. The trumpeter swan is the most magnificent of the northern swans and the largest of all waterfowl (weighing 20 to 38 pounds). It summers in Alaska and raises its brood of cygnets here. Izembek Lagoon (30 miles long and 5 miles wide) located 600 miles southwest of Anchorage along the southern tip of the Alaska Peninsula contains one of the largest eelgrass beds in North America. It is considered one of the most important wetlands in the world and in 1986 became the first wetland in the United States to receive global recognition by being named to the list of Wetlands of International Importance. The pristine environment and the abundant food source attract large numbers of Canada geese, virtually all of the world's population of Pacific black brant (130,000), puddle and sea ducks for a two-month period beginning in late August and ending in early November. The Pacific black brant is the smallest and fastest of the geese. They leave Izembek with a brisk tailwind and fly southeast across the Pacific Ocean

nonstop 4,420 miles to their primary wintering grounds in Baja California in just two and a half days.

MEMORANDUM 5

SUBJECT: May Day Fly-In and Air Show held in Valdez, Alaska

May 25, 2010

1. The May Day Fly-In was held on May 7, 8, and 9, 2010. This was the fourth consecutive year that I had flown the Arctic Tern to Valdez to attend three days of aviation activities. The Fly-In kept getting better each year—better organized and managed. It is always interesting to meet pilots (some already known and some new pilots) and others that attend the aviation events in Valdez. The weather always seems to create difficulty flying from Anchorage to Valdez and back home. I found Thompson Pass closed twice because of low clouds and fog and had to go around it by flying to the Copper River. The strong winds blowing up the Copper River were whistling by at 45 miles per hour. I had to fly 3,000 feet above the river to escape the dust clouds coming up from the bottom of the valley. Flying across Prince William Sound is a shorter distance to Valdez but I don't like flying an hour over open water with almost no place to land if there were an engine failure. Most beaches in Prince William Sound are too narrow and rocky even at low tide to land on in case of emergency. The weather this year was sunny with light winds for three consecutive days during the Fly-In. More than 200 pilots flew airplanes to the Fly-In. Most pilots were from the Kenai Peninsula, Anchorage, the Matanuska-Susitna Valley, and Fairbanks. There were also several pilots from the Lower 48 states.

2. The annual May Day Fly-In and Air Show brings together some of the best bush pilots in the world. They test their skills in the Short Field Take-Off and Landing (STOL) competition which is the major flying event. Airplanes are divided into the following classes: Light Touring (Cessna 150, 170, 172, 175, 177; Stinson 108); Heavy Touring (Cessna 180, 185, 182, 206, 210; Maule M-7, M-9); Experimental Bush Class and Bush Class (Piper 12, 14, 18, 22; Stinson 105; Citabria, Arctic Tern; Scout; Maule M-4, M-5). Can you imagine a Super Cub taking off from a starting line in 68 feet and landing in 63 feet past the line? Those were Paul Claus' numbers

when he won the Bush Class competition. He has over 25,000 hours of flying in Alaska and is one of our best bush pilots. Paul also won the Heavy Touring competition in a four-place Cessna 185 with a takeoff distance of 180 feet and landing in 250 feet. Paul won the Experimental Class in a Carbon Cub with about the same performance as the Super Cub. Paul won again in the Bush Challenge in a Super Cub loaded with 300 pounds of cargo with a takeoff distance of 96 feet.

3. Other scheduled events include pilot sessions (discussions on bush flying and maintenance tips), airplane rides, aerobatic demonstrations (flown in a Super Cub by Marc Paine), remote-control airplane demonstrations, Flour Bombing (pilots throw sacks of flour out of airplanes to a target on the ground), and the Poker Run .

4. The Poker Run is for pilots who arrive in Valdez for the Fly-In and desire to make an organized group flight into Prince William Sound. It was scheduled for Saturday afternoon beginning at 3:30 PM. The Poker Run is a 204-mile counterclockwise circuit through the eastern portion of Prince William Sound. It starts at Valdez and you fly west on Port Valdez, then south on Valdez Arm to Tatitlek. Next is a landing at the gravel strip near the Native village of Tatitlek. From here you continue the flight across 40 miles of open water on Prince William Sound to Hook Point on the southeast coast of Hinchinbrook Island. Here on the sandy beach facing the Gulf of Alaska we all landed. There were 69 airplanes on the Poker Run this year (a record) and it was interesting to walk the beach and see so many airplanes with tricycle type landing gear here. Pilots infrequently land this type of aircraft on sandy beaches. A Cessna 185 on wheel floats even landed on the sandy beach at Hook Point. All the pilots gathered near the beach to get a group photograph. The next landing was only 10 minutes away at Cordova Municipal airport on Eyak Lake. This is a small gravel strip just outside Cordova, a small commercial fishing village of approximately 2,000 inhabitants (I lived in Cordova in 1972 working for the US Forest Service). Our next landing would be at Cordova Mudhole Smith Airport which is a few miles east of Cordova in the Copper River Flats. This is the jet airport that serves Cordova. Do you know of any other place with 2,000 people that has jet airport service? Alaska Airlines

provides service west to Anchorage or east to Juneau, Sitka, Ketchikan, and Seattle on a daily basis.

5. The next flying is to the Copper River and then north upriver. The entire floodplain on the Copper River was still covered with a foot of snow. It looked like winter! This was my first time as pilot in command flying over the lower Copper River. In July 1970, I and another kayaker had paddled down the Copper River from Chitina. This is a 110-mile journey on a beautiful glacial river with mountains on both sides. You can't paddle out through the mouth of the Copper River because it is too shallow. We exited the lower Copper River on one of its tributaries (Alaganik Slough) to the Gulf of Alaska. From here we paddled 10 miles west to the Eyak River and up the Eyak River (6 miles) to Eyak Lake Dam. We lifted our kayaks over the dam and paddled in Eyak Lake to Cordova.

6. It was great to see the kayak route from the air. The Copper River is unique. The lower Copper River enters Miles Lake and flows out the lower end. A very large glacier (Miles Glacier, which is 35 miles in length) calves into the lake. We paddled our kayaks near the terminus of the glacier and a large front section of ice on the glacier broke off, sending large chunks of ice into Miles Lake. This created waves several feet high. The roaring noise of the waves terrified us. We paddled hard toward the middle of the lake to get away from the big waves. We could not outrun the waves; they overcame us. We turned to face the waves head-on in our kayaks. The waves were not a problem for the great Klepper kayaks (a canoe would have ended in a disaster) although I can still remember that loud roaring noise the waves made as they streaked across Miles Lake. A few miles downriver from Miles Lake we came upon the Childs Glacier, which forms the bank of the river for 2-miles on the west side. I do not know of another river that has a 2-mile-long ice bank that calves into the river. Very special indeed! The last part of our flight was up the Tasnuna River over Marshall Pass to Valdez. There are beautiful mountains and glaciers here—the mountains rise from sea level to over 8,000 feet.

7. The May Day Fly-In in 2010 was a great joy and I hope to be able to return for many more Fly-Ins in future years.

MEMORANDUM 6

SUBJECT: Flying to Mount Marcus Baker in the Chugach Mountains

September 3, 2009

1. Thursday, September 3, 2009 was a sunny day in Anchorage. I decided to fly to the Knik River and complete a trumpeter swan survey. I keep track of the nesting swans and record broods of cygnets to determine how many make it through the summer to fledging. After the swan survey was completed, I landed the Arctic Tern on a gravel bar. I set up my folding chair and had lunch on a pleasant day with little wind and the temperature up to 58 degrees Fahrenheit at 2:20 PM. Then I hiked along the gravel bars for about an hour. On the hike, I kept seeing large flocks of sandhill cranes passing overhead at about 6,000 feet. The cranes were already on their traditional fall migration out of Alaska to the Lower 48 states for the winter. The cranes were telling me that the weather in the high mountains they would be crossing must be very good. I decided to take that signal from the cranes. I'd get in the Arctic Tern and fly into the massive mountain and glacier country to the east over the Knik Glacier in the Chugach Mountains.

2. I was now flying low over the terminus of Knik Glacier which is only 200 feet above sea level. I knew I would have to gain thousands of feet in elevation to climb to the top of the glacier. The top of the glacier is a snowcovered pass at an elevation of 8,400 feet. The back side of the pass drops off into Radcliffe Glacier, which falls down to Harvard Glacier, which flows into salt water in Prince William Sound. I'll have 25 miles to fly up Knik Glacier before arriving at the pass. This will take about 20 minutes from the terminus of the glacier. A steady climb rate at 500 feet per minute will meet my goal. The Tern will climb at the needed rate at the normal cruising power setting. There were many glaciers and mountains on both sides of Knik Glacier. I took more than 50 images with my hand-held Canon digital camera flying to the pass. When arriving at the pass I wanted to circle around a couple of times and look at the mountains and glaciers in

this snow-covered environment. I also did not want to stay too long at this high elevation as the oxygen level is quite low.

3. My goal for flying up to the top of Knik Glacier was to get close-up views of Mount Marcus Baker's pristine snow–cone summit and to look for places to land ski-equipped airplanes in winter. Marcus Baker at 13,176 feet above sea level is the highest mountain in Alaska's Chugach Mountain Range. Although many mountains are higher in elevation, Marcus Baker rises approximately 13,000 feet both from the west (terminus of Knik Glacier) and from the east (salt water at Harvard Glacier). Few mountains have this type of awesome vertical relief. Beside this, Marcus Baker is surrounded on every side by massive glaciers and snow-capped mountains. There are 10 snowy mountain peaks that are over 12,000 feet in elevation near Marcus Baker. All these mountains are unnamed. We should be able to land our ski planes at the top of Knik Glacier at 8,400 feet elevation. I plan to have other pilots go with me in the winter.

MEMORANDUM 7

SUBJECT: Next Ski Landing: Alaska's Legendary Mount McKinley Base Camp

March 28, 2008

1. For years, ever since I put skis on my first airplane (Piper Cub) back in the mid 1980s, I wanted to fly into the Mount McKinley Base Camp (BC) on the Kahiltna Glacier. Eighty percent of the mountain climbers who climb to the top of the North American continent go into this BC. From BC, the climbers travel on skis or snowshoes to the top of Kahiltna Glacier and onto the west buttress of McKinley to the top. More than 1,000 climbers each climbing season (many climbers from foreign countries) come to Alaska to climb McKinley. (Mount Rainier, 60 miles southeast of Seattle at 14,410 feet ASL, has on average about 100 climbers per year.) Climbers enter Alaska by flying into Anchorage International airport and driving to Talkeetna, where they hire an air taxi to fly to McKinley BC. The BC is a 40-minute flight from Talkeetna. The airplanes are equipped with skis that have retractable wheels so the pilots can take off from the Talkeetna Airport on wheels and land with skis on Kahiltna Glacier. The ski landing site on Kahiltna Glacier is about 35 miles beyond the terminus of the glacier at an elevation of 7,200 feet above sea level.

2. Mount McKinley rises in elevation 19,520 feet from the terminus of the Kahiltna Glacier (800 feet) to its summit (20,320 feet). This vertical rise from the lowlands is unsurpassed anywhere in the world. At 63 degrees north latitude, McKinley is the highest big mountain closest to the Arctic Circle (66 degrees 34 minutes). This high latitude makes McKinley the world's coldest big mountain. (Mount Everest, the world's highest mountain, is located at 28 degrees north latitude which is the same as Tampa, Florida). McKinley is a permanently snow-covered mountain from its snowy summit down to 1,500 feet along its base. Five massive glaciers from 20 to 45 miles in length flow from high on the mountain to the lowlands. The lowest temperatures on McKinley are from November to April with average temperatures ranging from minus 30 to minus 70

degrees Fahrenheit recorded at the 18,200 foot level at Denali Pass. Nighttime temperature at the 17,200-foot-high camp in May when climbers are on the mountain frequently is minus 30 degrees Fahrenheit. McKinley is terribly unforgiving for inexperience, ignorance, and poor judgment. Measured by any standard, McKinley is one of the world's great mountains with its awesome size, power, majesty, and stunning beauty.

3. Dee, John, and I agreed to attempt a fly-in and landing at McKinley Base Camp in mid to late March when the weather was appropriate. By this time of the winter, the temperatures at BC would not be too extreme and we would have longer daylight. Flight time to the BC is about 1½ hours from Merrill Field in Anchorage, Alaska. On Monday, March 24, after checking out the weather, we found good weather to fly into BC. Dee could not take off from work and I had difficulty finding John. By the time I reached John by telephone, we decided it was too late to go. From where my airplane was parked at Merrill Field in Anchorage, I could see McKinley's dome and it was as clear as a bell—no clouds anywhere. I had mulled over the thought of making the flight solo but couldn't quite make a final decision to take on this challenging endeavor alone. Great opportunity was blown. Only hope was that we would get another good flying day soon. On Friday, March 28, we had another suitable day that was not as good as Monday but it was good enough that we decided we should make an attempt. Again, Dee could not take off from work; that left John and me.

4. John was taking a friend with him in his Super Cub to a cabin on a small lake in the Susitna Valley halfway to McKinley BC. The plan was for John and his friend to go to the cabin first. They would install an electric fence around the cabin to keep bears soon coming out of hibernation from breaking in. I was to fly to the lake 1½ hours later and meet them. We would leave together for our flight to McKinley BC.

5. I departed Merrill Field at 11:40 AM Friday. When I arrived in the vicinity of the cabin where John had landed, I was at 5,000 feet elevation and fighting a 14 mph headwind. I decided not to go looking for the small lake because it would be difficult to find in a snow-covered landscape. Searching for the lake and having to climb again to 5,000 feet would burn

up too much fuel. This would not leave me with sufficient fuel to continue to McKinley BC and back to Merrill Field.

6. If I was going to McKinley BC, it would have to be a solo flight. This is something I had wanted to avoid but often plans change due to circumstances beyond my control. Finally, I reached the terminus of the Kahiltna Glacier. It is the glacier that has the greatest length on McKinley. The glacial ice gently climbs for 45 miles from its terminus at 800 feet to 10,200 feet at Kahiltna Pass. I would need to follow the glacier for 35 miles to BC at 7,200 feet elevation. The flight up the glacier was impressive, with spectacular snow-covered mountains on both sides of the mammoth glacier that was 2 miles in width. Kahiltna Glacier near the BC opens up into a basin that is 5 miles wide. Surrounding the basin are these impressive mountain peaks: Foraker (17,400 feet), Crossen (12,800 feet), Kahiltna Peak (13,448 feet), Hunter (14,573 feet), and the awesome south face of Mount McKinley. Mount Hunter's elevation tops the highest mountain in the Lower 48 states, which is Mount Whitney at 14,495 feet. I located the BC landing strip as I could see airplane ski tracks on the glacier. Nobody is there! The wind was a light headwind so I went in and landed uphill on the sloping glacier. I was on the glacier at McKinley BC. WOW! Such a grand place to be with all the incredible mountains all around but as always, this is Alaska. Not so fast! Before I could start walking away from my Arctic Tern to take some images, I noticed the 10-12 mph breeze down glacier, the direction in which I would have to take off. This worried me because the tailwind deteriorates lift and the density altitude at 7,200 feet makes it even more difficult to lift off the glacier. The ambient temperature was zero degrees Fahrenheit at 1:20 PM, the warmest part of the day. Nighttime temperature would be about 20 to 25 degrees Fahrenheit below zero. I was hoping the winds would die down but also thought about if the winds picked up and I was not able to fly out. I did not want to put up my tent and spend the night here. That would require preheating the Tern's engine to get it started and concern about frost on the wings. If it started snowing, I might be here for several days. The safest procedure was to be on the glacier for a very short time and fly out of here before any drastic changes occurred. Frantically, I got a few amateur images and at 1:40 PM got back in the Tern and gently flew off the glacier, returning to Merrill Field. The takoff was no problem as the 20 percent slope compensated greatly for the tailwind.

7. John flew in later but never found my ski tracks at Kahiltna Glacier. He did fly up the Ruth Glacier and landed at the Sheldon Mountain House in Ruth Amphitheater.

8. This was the last ski flight of the winter as the temperature at Merrill Field was 44 degrees and the snow was melting fast.

MEMORANDUM 8

SUBJECT: Ski Landing on the Top of the Harding Ice Field

January 24, 2010

1. Finally, after many years, I have succeeded on getting to the top of the amazing Harding Ice Field. Dee in his Piper PA-12 and I in the Arctic Tern landed on top of the Harding Ice Field at 3:20 PM on January 23, 2010. We landed our ski-equipped aircraft at 5,400 feet on the south end of the ice field. A second ski landing was made three miles southeast of the first landing at an elevation of 5,600 feet. The Harding Ice Field is on the Kenai Peninsula 80 miles south of Merrill Field (Anchorage, Alaska). The sunny day was unusually warm at 25 degrees Fahrenheit. The wind was light.

2. The Mountaineering Club of Alaska (MCA) sponsored a 30-mile ski trek every two- or three-years across the width of the Harding Ice Field (from east to west) in the 1980s and 1990s. This trek started in Seward, Alaska and participants were taken by boat to a glacier on the east side of the ice field. All skiers carried a fully equipped backpack (mountain climbing gear, warm clothes, food, stoves, and tents) for winter trekking. The route took skiers up a glacier beginning near sea level to the top of the Harding Ice Field at over 4,000 feet. From here the route went west down into the Tustamena Glacier, ending at Tustamena Lake. The party would be flown off the lake and taken to Homer, Alaska.

3. One of my primary outdoor recreational goals since joining the MCA in the late 1970s was to get on this trek and set foot on the Harding Ice Field. It never happened. The ski trek took about 4 to 6 days to complete; however, if fog rolled in or snow-storms arrived, the skiers were stuck in their tents until it was clear again. It is much too dangerous to be navigating with a compass on a snow-covered ice field and glaciers when you can’t see where you are going. Chances of falling into a snow-covered crevasse increase significantly when visibility is restricted. It always seemed like I never found out about the next trek far enough in advance to schedule it. My work schedule with the federal government did not allow me to take leave from work on short notice.

4. Glaciers are plentiful in Southcentral Alaska near Anchorage. There are literally scores and even hundreds of glaciers in the Alaska, Talkeetna, Chugach, and Kenai Mountain Ranges in close proximity to Anchorage. Ice fields in Alaska are somewhat less common than glaciers and they have caught my attention. There are only four large ice fields in the United States and the Harding is the largest contained wholly within its borders. The Harding is approximately 50 miles in length (oriented northeast–southwest) and 15 to 20 miles in width. The ice field spawns approximately 40 glaciers which flow down the sides of the ice field. The surface area of the ice field including the glaciers is approximately 1,100 square miles (704,000 acres). Compare this to the size of Rhode Island at 1,545 square miles. The ice field is a relatively flat ice-covered plateau surrounded by mountains. A few stray mountain peaks penetrate and rise above the icefield. These mountain peaks are called nunataks. The thickness of the ice field is estimated to be 1,000 feet. It was formed by thousands of years of colossal snowstorms blowing in from the moisture-laden Gulf of Alaska, dumping 400 inches or more of snow every year on the plateau. The pressure from the snow layers eventually forms ice. The ice cap or ice sheet is flat and does not flow like a glacier. This greatly reduces the likelihood of crevasses and makes it a safer ice environment to traverse on skis.

5. I have flown over the Harding Ice Field in the Arctic Tern about a dozen times in summer while flying on the Kenai Peninsula. The astonishing beauty of a flat ice sheet so vast and surrounded by snow-covered mountains is awesome. This has piped my interest to come back in winter on skis and land on the ice field. I have also taken visitors to Seward to fly over the ice field in summer. Dee and I made a flight on skis to land on the Harding Ice Field on March 17, 2007. But the ice field had other plans. A huge low-pressure storm with 100 mph winds had swept through the ice field previous to our flight. The winds had blown the snow on top of the ice field into rough waves. The low temperatures after the windstorm froze the wavy snow into hard ripples almost as hard as concrete. We tried at least six different locations to land on the ice field and every time we dragged the snow we could feel the snow rattling our landing gear. We did not land, as it was a high probability that the hard and rough surface would damage (break) our landing gear. We would have to return on another day under better conditions.

6. The Sargent Ice Field is the second one on the Kenai Peninsula. It is on the eastern side of the peninsula adjacent to western Prince William Sound. The ice field is also a huge ice sheet (35 miles long and 15 miles wide), a little smaller in size than the Harding Ice Field. Most of the ice field is lower in elevation (2,000 to 3,000 feet) when compared to the Harding (4,000 to 5,000). Dee, John, Pete, and I made two landings on the Sargent Ice Field on March 3, 2007. Dee and the author made two additional landings on the Sargent Ice Field on February 23, 2008. The Sargent Ice Field and surrounding mountains are stunning and among the most striking in Alaska.

7. Landing on the Harding Ice Field is an epic and life-fulfilling event. The ice field is only a one-hour flight from Merrill Field; however, there are not many days the weather will allow you to fly there. It is also difficult to get accurate weather reports. This often means that halfway to the ice field the weather ahead (low clouds, strong turbulent winds) shuts down your plan. You will have to turn around and fly back to Merrill and try another day. Very few pilots land ski-equipped aircraft on Harding Icefield.

8. Many pilots in Alaska fly ski-equipped aircraft in winter. However, it is surprising how few of these pilots fly into and land their aircraft in remote mountain and glacier regions. Glacier landings are feared by many pilots. I fully understand the reluctance for this type of flying (midwinter, remote and intimidating). The vast mountainous and snow-covered glacier terrain takes your breath away and a chilling feeling surges through the brain. Pilots do crash in remote areas and all Alaskans are fully aware that you can disappear forever on these flights. Nevertheless, once you push forward and begin to explore this awe-inspiring wild country, there is no turning back. The vivid frontier is irresistible! “No humdrum of orderly life of social conventions or placid stream of regulated existence could ever satisfy you now or in the future”, says A.T. Walden in *Dog-Puncher on the Yukon* (1928). I think that I have now reached a pinnacle of being a bona fide dyed-in-the-wool Alaskan.

MEMORANDUM 9

SUBJECT: Ski Landings Mount McKinley: Revisit to North America's Tallest Peak

March 21, 2010

1. Sean with his blue Piper J-3 and me in the Arctic Tern left Merrill Field in Anchorage, Alaska at 11:25 AM on March 21 to fly to and land on the glaciers at Mount McKinley in the Alaska Range. Approaching the terminus of Kahilta Glacier we had headwinds up to 20 miles per hour. Flying up Kahiltna Glacier the winds subsided. Ski tracks were found 35 miles up Kahiltna Glacier at Mount McKinley Base Camp (BC). I went in and landed in the Tern at the 7,200 foot elevation on Kahiltna Glacier. Sean came in a few minutes later in his Piper and landed. I tried to taxi further up the glacier to allow for a longer distance on the glacier for a takeoff. However, the snow was deep and had a very strong resistance. With full throttle I could not advance up the glacier. We were stuck on the lower part where the wind blew down glacier at 8 to 12 miles per hour. That was the direction of our takeoff. This meant a tailwind which was not good for takeoff. We thought there would be sufficient distance for takeoff with the tailwind but it still bothered me.

2. Sean and I covered our engines with insulated covers to keep them warm (ambient temperature was 10 degrees Fahrenheit) while we toured around the Kahiltna Glacier BC. We put on our snowshoes and climbed 500 to 600 feet in elevation up a ridge overlooking our airplanes. We took many pictures of the dramatic mountain and glacier landscape. After about one and a half hours we decided that it was time to move on. We had other plans on Mount McKinley as we wanted to also land on Ruth Glacier near the Sheldon Mountain House. Our takeoff with the tailwind was more an illusion than a problem as we both got off the glacier in a rather short run (about half of the space we had before crashing into massive crevasses lower down the glacier). The downslope ridge (20 percent) we were taking off on shortened the takeoff distance by 50 percent. This counteracted the negative tailwinds on takeoffs.

3. We would fly south about halfway down Kahiltna Glacier and then fly east through an 8,000-foot mountain pass to Ruth Glacier. The winds were turbulent and blowing over 25 miles per hour. I did not want to fly through that narrow turret of a pass and find out how strong the winds would be. We continued down Kahilta Glacier until the mountain peaks were only 6,000 feet and we turned east here. The mountains were lower in elevation; however, the winds were still fierce. They began at 20 miles per hour and increased to 25 to 30, then to 35. Top winds were blowing up to 40 miles per hour and directly in the direction we were flying. Our ground speed slowed to 50 to 60 miles per hour. However, the strong winds were not turbulent so we kept going. It took a long time and used up our gas reserves bucking the headwind but we finally made it to Ruth Glacier. Once there the strong winds diminished to only 10 miles per hour. Great, landing on Ruth Glacier in the amphitheater looked promising. When we arrived at the Ruth Amphitheater, the winds were almost calm. There were many air taxis that had recently landed here and they had beaten down the snow. The landing would be quite easy. We went in and landed with no problems or apprehension. The landing elevation on Ruth Glacier is 5,800 feet above sea level. Walking off the packed-down area we found the snow to be 24 to 30 inches deep from a large snowstorm the previous week. Ambient temperature was 25 degrees Fahrenheit.

4. We found a well-packed trail that went up 300 feet elevation above our airplanes to the Sheldon Mountain House. This is a one-of-a-kind hexagon hut perched on top of a rock-and snow-packed ridge surrounded by the Ruth Amphitheater. It provided a panoramic view of the mountains and glaciers. We climbed up the well-packed trail in our boots (we did not need snowshoes) and found four people in residence. Three were Alaskans and one was from Sweden. They were in the middle of an eight-day trip. They skied cross-country each day on the glaciers around the Mountain House. We had seen their tracks flying in. They skied close to an almost vertical 1,500-foot granite spire sticking out of the glacier ice where the Great Gorge opens out into the Ruth Amphitheater. Some 30 years before, I had been with a small group of Alaskans that tented on the ice in the Ruth Amphitheater. We also skied underneath that great granite spire. We stayed about six days. At that time, when we were here in late March, the temperature was down to minus 20 to 30 degrees Fahrenheit each night.

They said the weather this year was warm with night temperatures of 0 to 10 degrees Fahrenheit. The same people had been here last year in March and they said it was cold—like minus 20 degrees Fahrenheit at night. This shows the weather can vary greatly from year to year.

5. My first ski landing near Mount McKinley was March 28, 2008 at McKinley BC. The snow was better for landing in 2008 than in 2010. The ski-packed trail on the glacier ran further upslope and provided a longer run out for taking off in 2008. This was not the case in 2010 as the previous pilot had landed at the lower end of the glacier and this made for a short, problematic takeoff. The short takeoff with tailwinds and the fierce winds approaching Ruth Glacier made for challenging flying. Flying in Alaska also seems to have the condition that somewhere in your journey you will be severely challenged. If you plan to fly in Alaska, you have to get used to the challenge and be up to it. That is not to say that you should not make the right decision when Alaska is throwing too much for you to safely deal with. You have to know when it is time to turn around and cease your journey. The many Alaskan pilots who pushed on when they should have stopped and are no longer with us are always on my mind. There are more than a few pilots in Alaska who have disappeared in their airplanes never to be found again. I certainly don’t want to be one of those—I want to live to fly another day.

6. Being able to fly to Mount McKinley and land on the glaciers near the huge mountain peaks in the Alaska Range is a life-changing flying experience. Landing at two locations on the same day is an epic journey. The inspiration of walking on the glaciers under the snow-draped mountain peaks is overwhelming. This is a flying adventure that I could repeat every year in March and never tire. I am fortunate to be able to take advantage of this great opportunity. I am also fortunate to find pilots willing to fly with me on many of my most difficult trips. Being able to fly and converse with competent pilots greatly reduces the pressure a pilot bears when flying alone. It took Sean and me 4.3 flying hours to make this journey in March 2010. Mount McKinley BC is 129 air miles from Merrill Field—Sheldon Mountain House in Ruth Amphitheater is 125 air miles. These distances were read off the Garmin GPS 92 in my airplane.

MEMORANDUM 10

SUBJECT: Extraordinary Ski Landings on the Kenai Peninsula, Alaska

March 13, 2011

1. Sunday, March 13 was a beautiful sunny day in Southcentral Alaska. I checked the weather and in particular the wind forecasts on the Kenai Peninsula. The northern part of the Kenai Peninsula showed wind at 5 miles per hour at Whittier (western end of Prince William Sound) and calm at Portage (eastern end of Turnagain Arm of Cook Inlet). This was a perfect day to go to one of my favorite glaciers—Spencer. Spencer Glacier is located on the northern end of the Kenai Peninsula 13 miles southeast of Portage and 52 miles southeast of Merrill Field in Anchorage, Alaska.

2. We decided to go to Spencer Glacier and look for places on the glacier where we could land our ski-equipped aircraft safely. Strong winds recently had blown the snow in drifts and created very hard snow that is not good for landing (you can break the landing gear on hard snow landings). Dee in his Piper 12 (three-seat Piper) was our leader. I'd be flying second in my trusty Arctic Tern. Tyler would follow me in his Piper 14 (four-seat Piper). This was Tyler's first winter on skis and it would be Tyler's first glacier landing. Flying is very relaxing having a skilled leader going first and relaying all important information to the other pilots. Group flying is the safest; however, many times pilots have to fly solo as other pilots are busy with jobs and family.

3. Dee circled over the upper part of Spencer Glacier and looked over the snow for a place to land. The wind was light and Dee dragged the snow with his skis downhill so that it would be easy taking off and getting airborne again. The snow was loose and powdery and great for velvetsmooth landings. Dee went down and landed, I came in and landed and Tyler made his first ski landing. We were on the top of the left lobe of Spencer Glacier at 3,000 feet elevation. We were looking northeast toward Blackstone Glacier which falls all the way down to Blackstone Bay in

Prince William Sound. In Blackstone Bay, we looked at Willard Island where Roy (my brother) and wife Janice camped a few years ago (we were kayaking in Blackstone Bay). To the west of us is the highly sculptured Carpathian Peak. Its elevation is 6,020 feet and it joins 35 other mountain peaks on the Kenai that are over 6,000 feet. The view in every direction from the top of Spencer Glacier is awe-inspiring. We took images with our point-and-shoot cameras and then flew away.

4. Our second glacier landing was at 4,000 feet on the upper part of Blackstone Glacier. This was the first time any of us landed on Blackstone. The snow was hard but we got in and out without any problems. The view of the surrounding mountains was simply marvelous. After leaving Blackstone, we flew to the top of the right lobe of Spencer at 5,000 feet. Dee dragged the snow and it was too hard for a landing. We had landed here several times in the past few years. The mountains here have snow pleats that are very scenic. We flew back to the top of Spencer on the left lobe and landed there at a different location than our first landing. We flew down to the toe of Spencer Glacier and landed on iced-covered Spencer Lake. The elevation here was 200 feet above sea level. We landed to get a close-up look at the calving glacier ice with beautiful green and blue colors. We flew back to Merrill Field and called it a day.

MEMORANDUM 11

SUBJECT: Ski Flying: Return to Mount McKinley

April 12, 2011

1. The snow had been melting fast at Merrill Field in early April and this would be our last ski flight in 2011. There was sufficient snow to taxi and take off even though only one half of the runway was snow covered. The snow had melted on the other half and it was all gravel. Sean and I talked about flying east and landing on the glaciers in the Chugach Mountains. That was until we saw the tip of Mount McKinley sticking up on the horizon. We immediately changed plans when we saw it was clear of clouds from Merrill Field to McKinley. McKinley is 130 air miles north–northwest of Merrill Field.

2. My first ski landing at Mount McKinley was a solo trip in late March 2008. The landing was at the Kahiltna Glacier Base Camp at 7,200 feet ASL. The next landing was on March 21, 2010. Sean in his Piper Cub went along on this trip. We landed at McKinley Base Camp and also near the Shelton Mountain House in the spectacular Ruth Glacier Amphitheater at 5,600 feet.

3. McKinley Base Camp was very beautiful on this day. It was slightly overcast with light winds and a pleasant temperature of 15 degrees Fahrenheit. A recent snowstorm had dumped 2 to 3 feet of powder snow on Kahiltna Glacier. There were no fresh ski tracks from other airplanes. My skis on the Arctic Tern sank from 12 to 15 inches in the deep snowpack. I set tracks on the glacier by dragging the snow flying downhill and then lifting off without landing. Then I landed flying uphill parallel to the top of the downhill tracks. I knew we would have to use my downhill tracks for takeoff to avoid the deep ski penetration in a takeoff in fresh snow. We sank about 2½ feet in the snow when we exited our aircraft. We both put on snowshoes and this made walking on the Kahiltna Glacier much easier. I still was gasping for breath with the lower oxygen levels at 7,400 feet above sea level. Mount McKinley (20,320 feet elevation), Mount Foraker (17,400 feet), Mount Hunter (14,573 feet), Mount Crossen (12,800 feet), Kahiltna

Dome (12,525 feet), Mount Frances (10,450 feet), and many other lesser mountains were all in their glory on this magnificent day in April 2011. There were a few clouds up higher on McKinley and Foraker that made the light on Kahiltna Glacier sublime. Sean and I hiked around for about an hour then got back in our aircraft and headed back to Merrill Field. My Garmin GPS showed Merrill Field was 129 miles.

4. We left Merrill Field at 1 PM and returned there at 5:30 PM. As I approached the airport, I was shocked—all the snow had melted on the runway in the past 4½ hours while we were at McKinley. Nothing but gravel showed. I told the tower's controller we could not land at Merrill Field with straight skis and that we would have to land on the ice at Lake Hood near Anchorage International Airport. We called Lake Hood on the radio and went in and landed on Lake Spenard. We taxied on the lake ice to the transit parking area and tied our airplanes down with ice screws. It was now 6 PM. Sean's girlfriend picked us up and took us back to our vehicles at Merrill Field. We both went home and loaded up our Alaskan Bushwheels and a jack and headed back to Lake Spenard. Sean did not want to leave his airplane at Lake Spenard so I helped him swap out the skis for the wheels. After 9 PM when it was getting dark, Sean took off on the lake ice and flew back to Merrill Field. I flew back to Merrill the next day. This was an exciting way to end the ski season.

MEMORANDUM 12

SUBJECT: Ski Landings on the Root Canal Glacier

April 28, 2013

1. Finally, after more than 10 years, I was able to fly to Mount McKinley and land my Arctic Tern taildragger on the Root Canal Glacier at 7,800 feet elevation. The glacier is near the granite rock walls of the Moose's Tooth. The flight was made with Sean in his Piper PA-14 on April 26, 2013. Shannon was also flying with Sean. Ray in his Back Country Explorer and the author attempted to land our airplanes on the Root Canal Glacier on April 14, 2013. We had perfect conditions—low winds and clear skies; however, we became so terrified with the steep mountains and narrow slots through granite towers you have to fly through to access Root Canal Glacier that we both decided not to land here. We opted for the Ruth Amphitheater near the Sheldon Mountain House and landed there at 5,800 feet.

2. Paul Roderick from Talkeetna Air Service pioneered landing on the Root Canal Glacier which is just below the Moose's Tooth on a ledge that plunges 3,000 feet steeply down to the Ruth Glacier in the Great Gorge. Paul's landings are in a turbine Otter. Every year mountain climbers are flown into Root Canal Glacier where they camp out in tents and climb the steep almost 3,000 foot granite walls to the top of Moose's Tooth at 10,300 feet or takes the easy route to the top in the Ham and Eggs Couloir. They usually don't arrive here until mid-April. This means that there are no airplane ski tracks here in March. Usually the first week in April is the last week for flying out of Merrill Field on straight skis. That is why I have never been able to land here—no airplane ski tracks and no visible markers to see where to land. We received more snow in April 2013 in Southcentral Alaska than any previous year I can remember; we received more than 2 feet in east Anchorage. This April has also had much lower temperatures than normal, from 10 to 20 degrees Fahrenheit at night. The snow has remained and ski flying has been great during the entire month of April.

3. I was shocked at the sublime attraction once we landed, got out of our airplanes, and started looking in all directions from nearly 8,000 feet

elevation on the Root Canal Glacier. We had a high in the sky perch where we could look to the northwest into the Ruth Amphitheater. We could see Mount Barrille (7,600 feet) which is near the Sheldon Mountain House, the Rooster Comb, Mount Huntington, and all the tall peaks on the west side of the Great Gorge such as Mount Dickey at 9,545 feet in elevation. We also had the most impressive view of the east face of Mount Hunter (14,580 feet). Mount Hunter is so special with the domed top which is glacier capped with huge amounts of fresh snow drifts. This is probably the most impressive view of Mount Hunter; its steep east face is an almost vertical buttress from the valley below until it reaches its domed top. The top of Mount McKinley was covered with clouds and could not be seen on this day.

4. Landing on the Root Canal Glacier has been sensational for me as it has removed the frustration of never being able to land my airplane here, walk the surface of the glacier, and seek out all the beautiful mountain peaks in the vicinity of Mount McKinley. Now I have done this and it has relieved a great tension I have had for a long time. I have always remembered what Mark Twain said: “Twenty years from now you will be more disappointed by the things that you didn’t do than by the ones you did do. So throw off the bowlines. Sail away from the safe harbor. Catch the trade wind in your sails. Explore. Dream. Discover.” Now I don’t have to think about a great disappointment in my later years of not landing my airplane on Root Canal Glacier.

5. Sean, Scooter, Terry, and the author were planning another flight on April 28, 2013 to fly to Mount McKinley. The day was sunny and we could see the dome of McKinley from Anchorage. The afternoon winds for Anchorage at 3,000, 6,000 and 9,000 feet were forecasted to be 12, 17, and 19 knots respectively. At Talkeetna they were forecasted to be higher at 30, 27, and 28 knots respectively. Moderate turbulence was also forecasted for these areas. I commented that this would probably be a rough flight with some turbulence. You can do it but it probably will not be very much fun. Flying to McKinley with the strong north winds will be slow and will eat up a lot of gas. What does it mean once you get to the big mountains near McKinley? It could be windy and this could prevent landing there. This could be a wasted trip to McKinley. We decided to wait a while because

FAA said the winds would probably subside as the afternoon went along. Terry dropped out but the rest of us decided we would go to McKinley on this sunny and windy day.

6. We departed Merrill Field in early afternoon. The surface winds were about 10 miles per hour leaving Merrill Field. The winds picked up to 15 miles per hour after crossing Knik Arm and flying north to McKinley. As we approached Big Lake the winds increased to 20-25 miles per hour. The winds kept increasing, at Red Shirt Lake the winds were up to 30-35 miles per hour. As we were approaching the Susitna River the winds were steady and the highest gusts were up to 40 miles per hour. Powerful updrafts and downdrafts were occurring frequently although it was not turbulent—only a light chop.

7. After passing over the Susitna River Scooter called to inform us he was turning back. He said the ground speed for his Piper PA-12 was only slightly over 50 miles per hour. At this rate, it would take 2 hours to reach McKinley. Sean and I decided to continue and hoped the winds would slow down and provide us with some relief. We could see the tops of Foraker and McKinley—they had massive lenticular clouds covering their summits. We wondered what this means lower down as we will be flying at 8,500 feet near McKinley. As we approached the Kahiltna Glacier, the winds slowed down to 20-25 miles per hour and upon reaching the terminus of the glacier, the wind was only 10 to 15 miles per hour. Ten miles up the glacier, the winds had completely stopped blowing, it was calm. As we approached the McKinley Base Camp at 7,200 feet above sea level, we could see a small lenticular cloud right there above the glacier; however, it was for the most part still nearly calm with only an occasional flurry of wind slightly buffeting our airplanes. The base camp is on a side glacier that flows into the Kahiltna Glacier. We took turns flying over the side glacier above the base camp. I was trying to look down at the base camp to see how many tents were there; however, the twisting and gusty winds made flying difficult. I had to concentrate entirely on flying—these snarling winds were dangerous and making a turn to get back to the Kahiltna Glacier had to be made with utmost caution. We both agreed that we would not land here today. The bottom of the squirrelly winds coming from that lenticular cloud

above the Kahiltna Glacier was right down there at the base camp. I can't believe our luck runs out so close to where we want to land.

8. Sean recommended we fly to Ruth Glacier and check out the winds there. We could land in the Ruth Amphitheater at 5,800 feet or possibly make another landing at Root Canal Glacier if the winds and clouds would allow. We flew down to the lower end of the Kahiltna Glacier and then traveled northeast to the lower part of the Tokositna Glacier. We crossed over snowcovered hills into the lower Ruth Glacier. The wind was calm here at 6,000 feet. We decided to climb higher to check the wind. At 8,000 feet, the wind was still calm. We flew to the Moose's Tooth and saw no clouds on the Root Canal Glacier. We decided to return here as we enjoyed our first landing so much. The snow surface on the glacier was the same as it was when we made our first landing two days previous—wind packed and hard. Our skis sank in the snow very little on landing. The light was different from the first landing and the multitude of mountain peaks that can be seen was ever so beautiful.

9. There were 6 tents with climbers camping out on Root Canal Glacier on April 26, 2013 when we made our first landing here. Today, there were 5 tents. We could see the tracks of the airplane that came in to take the climbers out. The ambient temperature was 10 degrees Fahrenheit. We talked to climbers—one lady from Detroit and two men from Japan. The Japanese climbers told us they had already ascended the Moose's Tooth and were planning a second climb on the Ham and Eggs Couloir before returning to Japan. When flying out of the Root Canal Glacier I counted approximately 20 tents on the Ruth Glacier in the Great Gorge. These are occupied by mostly rock and mountain climbers that scramble up the almost vertical granite walls of the nearby half dozen mountains with a topographic prominence of 4,000 to 5,000 feet. The number of tents on the Kahiltna Base Camp was only about a dozen. I surely thought there would have been more climbers there in late April. About 90% of the 1,200 or more climbers on McKinley each year fly into this base camp and launch their attack on the mountain from here. They climb McKinley in April, May, and June each year. This is the starting point for the classical West Buttress route, the least technical to reach the summit.

10. Our return trip to Merrill Field at about 5:30 PM was smoother flying than our flight to McKinley. The winds had greatly diminished by the time we headed back home. We picked up a tailwind of 10 miles per hour after leaving the mountains. The tailwind for most of the flight was from 10 to 20 miles per hour. I did not notice large updrafts and downdrafts like we encountered on our way north. These had all faded out with the diminished winds. Merrill Field still had snow packed runways when we arrived for landing. This will be the last flight on skis this spring.

11. The ski flying season in the winter of 2012 and 2013 did not start out on a sound footing. We had many days with those notorious northeast winds blowing too hard for flying. We also had days with low clouds and fog and snowy days which prevented flying. I had only 6.5 hours of ski flying by March 1, 2013. This was likely to be the lowest number of ski flying hours in the past 10 years or more. I usually average 55 hours of ski flying each winter. March 2013 had many days of great ski flying weather like it always has in past years. I accumulated 13 hours of ski flying in March. The large amount of snow in the first part of April and the low temperatures gave us the complete month of April for flying with straight skis for the first time that I can remember. I was able to fly 25 hours in April. This increased my total ski flying this winter to 44.4 hours by April 28, 2013. With the multiple flights to McKinley in 2013 and finally landing on the Root Canal Glacier—this ski flying season will be remembered as one for the ages.

MEMORANDUM 13

SUBJECT: Knowledge and Techniques for Ski Flying in Alaska by Don Bowers[1]

March 10, 1995

(1) Metal Skag. Helps to control aircraft on ice.

(2) Rear Cable. Keeps the ski at the proper angle in flight.

(3) Front Springs or Bungee. Keeps the ski in tension against the rear cable.

(4) Check Cable. Keeps ski from dipping or drooping too far if the spring breaks or fails.

(5) A Drooped Ski. A very serious event that can cause loss of control of aircraft because of the sudden pitch-down moment. Slow aircraft down and fly in an increased angle of attack.

(6) Ski Installation and Removal. Requires only an entry in the Aircraft Log Book by an A&P.

(7) Essential Items to Carry in Aircraft While Ski Flying. Snowshoes and snow shovel (absolutely mandatory). Compactor bags and duct tape.

(8) Ability of Skis to Slide across the Snow. This is dependent on its ability to melt snow or ice crystals through the heat of friction. Skis then slide on the thin layer of water.

(9) Rough Ski Surface Can Be A Problem. Scratched ski bottoms can reduce the slick factor. Frost, ice, or frozen snow can form on rough surfaces.

(10) Always Park Aircraft on Hard Packed Snow or on Existing Tracks.

(11) Where You Tie Down Your Airplane, Always Place Wooden 2 × 4s Under the Skis.

(12) If Skis are covered with Frozen Snow or Ice. Only option is to free ice or frost from skis.

- Use power and move rudder from side to side.
- Rock wings (helper on the ground shaking the wings).
- Use 2 × 4s and pry skis up. Scrape off frost, ice, or frozen snow.
- Cover skis with compactor bags and tie on with duct tape. The plastic bags will blow off in flight.
- Clear ice, frost, and frozen snow off skis by high-speed touch-and-goes.

(13) Ski Taxiing. Keep skis moving briskly. Slow speed will allow ski to grab and to try to stop.

(14) Turns on Skis. Turns should always be made to the left to take advantage of engine torque. Use moderate speed to maintain momentum when turning.

(15) Excessive Load on Ski Gear. Do not place excessive load on the gear on the inside of the turn. Slow down to turn. Turns on rough surfaces need to be kept as slow as possible but fast enough to avoid ski grabbing and stopping.

(16) Turning Skis. Apply power while pushing the desired rudder (stick forward) and nose-down elevator will make things easier by raising the tail at least partly out of the snow and allowing the propeller blast to hit the rudder, thus facilitating the turn.

(17) Be Careful When Turning on Skis. Ski length allows it to put enormous twisting moments on the axle and gear leg, far more than a wheel. Too much speed or too sharp a turn will cause the inside ski to dig in. This can cause the gear leg to twist and collapse or snap off the axle.

(18) Skis Sliding Sideways. Do not let the skis slide sideways on ice or snow. If they suddenly hit an obstruction, a ski can catch and flip the aircraft over or collapse the gear.

(19) Wet, Sticky Snow. Wet, sticky snow is worse than mud for impeding a takeoff. Wet, sticky snow often happens at or above freezing temperatures.

(20) Side Load on Skis. Light plane landing gear was not designed for high-intensity side loads that skis can cause. A ground loop on skis usually means major structural repair because the gear will probably be seriously damaged.

(21) Takeoff. May have to lift one ski off at a time; sticky or old snow with a high resistance.

(22) Use Existing Tracks for Takeoff. Alternative is to use snowshoes to pack a runway.

(23) Don't Land or Takeoff on a Dog-Leg Strip. Too much side load.

(24) Snowmachine Tracks. Watch out for buried snowmachine tracks crossing landing areas.

(25) Safest Ski Landing. It is on a packed runway.

(26) Open Snow Landings can be Fun but can Easily Cause Problems.

(27) Overflow. Overflow is more prevalent near inlets and outlets of lakes. Check for overflow by making a touch-and-go and come back to see if the tracks become darker—meaning water is seeping into them from below. Any indications of overflow require quick exit.

(28) Drifts. Drifts can be a big problem and must be avoided for landings and takeoffs.

(29) Glare Ice on Lakes. Be cautious when landing on glare ice on lakes. Lakes can freeze with cracks and pressure ridges that can grab skis.

(30) Avoid Flat-Light Landings (Whiteouts). Avoid flat-light landings in open snow like the plague. Can't see a two-foot snow drift.

(31) Open Snow Landings. Add power once on the surface to keep moving to a suitable parking area. First make a touch-and-go (or several) to

establish a set of tracks. Make a left turn and a loop back to the takeoff position. Stop on the tracks heading back for takeoff.

(32) Can't Stop on Ice. If you cannot stop on ice before hitting the shoreline of a lake, make an intentional ground loop by adding power, pushing the nose over, kicking full left rudder, pouring on the power to decelerate the by now backward slide. Chances are the ski will spin on the ice without grabbing and no damage will be done.

(33) Stuck in the Snow. The most common king of stuck is when one ski digs in, creating a lopsided or unleveled aircraft. Solution—you'll need snowshoes and a shovel. Dig snow from under the high ski and make it level with the sunken ski. Dig ramps for skis back to the top of the snow pack. If snow is very deep, snowshoe a path to the runway. Propeller clear of snow.

(34) If Snow Swallows the Aircraft on Landing. If snow has swallowed the aircraft on landing, it's time to put on the snowshoes. Stomp out a path to ski tracks or a whole runway if necessary. May need to shovel a ramp in front of the aircraft.

(35) Ski Landings. (A) Look the landing area over thoroughly for a smooth surface. Don't land in areas with snow berms, wavy snow, depressions, holes, and other obstacles. Look for protrusions in the snow such as snow domes—they could be hiding a large boulder under the snow. (B) Always drag the landing area prior to making a final landing. (C) Determine the following snow characteristics before landing: (1) Type of Snow: (a) Light, dry powder snow; (b) Dense, old, hard snow; (c) Wet, sticky snow. (2) Snow Depth. What is the depth? How many inches do the skis settle into the snowpack? **(**3) Snow Drag. Determine the snow drag or resistance on the skis; for example, is it low, medium, or high? This will affect takeoff distance. (D) If the snow is deep powder, old hard snow, wet sticky snow, or other snow conditions that will make for a difficult takeoff due to excessive resistance on the skis—drag the landing area two times longer than needed for normal takeoff. Then come back around and land short of your tracks—taxing ahead to the ski tracks. Takeoff will be straight ahead in the preset tracks. If there is limited landing space, you may have to set up two sets of parallel tracks. This is accomplished by dragging the two areas (not

landing). Landing will be with a tailwind on the right-hand tracks so that you can make a left turn into the left-hand tracks. The takeoff will be into the wind on the left-hand tracks. (Item 35 by William A. Quirk, lll)

(36) Taking off Down-Slope. Taking off on sloping terrain is a great equalizer for high density altitude and tailwind problems. Your aircraft will need one-half the distance for takeoff on a 20 percent slope when compared to level ground. (Item 36 by William A. Quirk, lll)

[1]Don Bowers was a pilot for Hudson Air Service in Talkeetna in the 1990s. Don was an author, teacher, and well-known veteran of the Iditarod Trail Sled Dog Race. He was also known for flying a Cessna 185 as top cover for Mount McKinley rescues, guiding the National Park Service's high-altitude Lama Helicopter through holes in the clouds to save mountain climbers in trouble. Don and three park service employees died in a tragic accident in June 2000. Don was flying the rangers from Talkeetna to Kahiltna Glacier base camp when horrific weather with extreme winds and poor visibility prevented his entrance onto the glacier. He flew west to clear the extreme weather; however, strong winds caused the plane to go down near the junction of the Yentna and Lacuna Glaciers. It crashed and burned. There were no survivors.

KNOWLEDGE AND TECHNIQUES FOR SKI FLYING

Pilots must learn and understand the 36 guidelines to successfully operate a ski-equipped airplane. Remember that it is highly important not to just read and be aware of these items but to deeply understand the meaning of each one thoroughly. Go out and practice what they are telling you. And the most important consideration is to always remember to have a very active and thinking mind while out flying. Think about all these items that you have studied and learned and correctly incorporate them into your everyday flying skills. (William A. Quirk, lll)

MEMORANDUM 14

SUBJECT: Ski Flying on a Cold Winter Day in Southcentral Alaska

January 18, 2012

1. January 18 in the Anchorage area was forecasted as a sunny day with light winds. This could be a good flying day. The ambient temperature at Merrill Field at 8 AM was minus 18 degrees Fahrenheit. Quite cold; however, it may warm up after the sun comes up. I prepared breakfast and by 10 AM, as the sun was coming up, I drove to Merrill Field. I have a two-step procedure to warm up the engine in the Arctic Tern. First, I have a heat pad glued underneath the oil pan that is plugged in overnight. This keeps the engine oil warm. I also have a 100-watt light bulb turned on inside the cowling. This lessens the chance that I will have a coldsoaked engine. Second, I plug in a small 1,000-watt electric heater that is inside the cowling. After 1 or 2 hours, this will warm up all parts of the engine and in particular the crankshaft. The cowling is sealed off with a well-insulated cover so that the engine compartment will retain heat. At 10:30 AM the ambient temperature rises to minus 10 degrees Fahrenheit. At 12:30 PM, the engine is warm enough for starting. The ambient temperature now has warmed up to 0 degrees Fahrenheit.

2. Preparing the Arctic Tern for flight involves removing the black nylon wing covers, the windshield cover, the propeller and nose cone covers, the horizontal tail covers and the engine cover. I rolled up all these covers with the exception of the engine cover and placed them in a 2-by-8 foot fiberglass snow sled. The engine cover is always carried in the Tern so it could be placed over the cowling to keep the engine from cooling down too fast when on the ground for any length of time. Now, I use a fulcrum and lever to lift the front and back part of the skis to remove the wooden 2-by-4s that keep the skis out of the snow. This would prevent snow freezing on the bottom of the skis. Frozen snow on the ski bottoms would keep the aircraft from moving forward, even at full throttle. I placed my daypack (lunch), a canister of water, and a nylon bag with warm personal equipment

in the Tern. In the equipment bag are several pairs of gloves and mitts, ski stocking cap, winter hat with ear flaps, face mask, wool socks, and other warm gear. I also carry a tent with a winter sleeping bag, a stove and lightweight freezedried food to last for a week. The latter are always stored in the Tern as emergency items for a length of stay on the ground. I checked the oil level on the dip stick and walked around the aircraft to make an inspection and looked for anything that would need attention. I am now ready (after about an hour or two) to get in the Tern, start the engine, and go flying.

3. Another pilot was supposed to go flying with me today but he did not show up. Sunset was at 4:20 PM today, so I'd go flying alone as there was no time to wait any longer. I wanted to go to the glaciers in the Chugach Mountains but would change that destination to a flight to the north, where there are roads and homes scattered in the terrain. The latter was safer flying alone. On a weekday, flying and landing on the glaciers, pilots would often see no other pilot. I had made many solo flights into the glaciers in past years; however, today I would want to be safer as I have not made a landing on a glacier in 2012.

4. I flew over Knik Arm of Cook Inlet and then north towards Big Lake. The ambient temperature flying at 1,000 feet above the terrain was minus 10 degrees Fahrenheit. I continued flying north beyond the road system until I reached the Willow Hills, which was 50 miles north of Merrill Field. I found a suitable place here and dragged the snow to see if the conditions were favorable for landing. The snow was soft and the skis penetrated about a foot. I came around again and landed short of my tracks so that I could take off straight ahead in the already established tracks. A takeoff is easier in set tracks versus taking off in loose snow. My first priority after landing was keeping the engine warm, so I quickly grabbed the engine cover out of the baggage compartment and placed it over the cowling. The temperature in the Willow Hills at 3,200 feet elevation is minus 16 degrees Fahrenheit. I decided to stay here and enjoy the fresh air on a sunny day. From where the Tern was parked I can see the Talkeetna Mountains rising up on the east. Mount McKinley was clear and could be seen in the west.

5. I put my snowshoes on and headed out across the snow-covered terrain to a small hill. I climbed the hill and was awarded a splendid view of the surrounding plateau and mountains in the distance. The Tern was over a mile away and it looks as small as a toy airplane. I took a few images from the top of the hill and then snowshoed back down in my tracks to the Tern. Strolling through the deep powder snow was great exercise. When I reached the Tern, I checked the oil temperature gauge and it showed 130 degrees Fahrenheit. This was plenty warm and I'd have time to eat lunch before departing the Willow Hills. I had small pieces of cheese, crackers, pecans, one half apple, and dates. After eating about half of my lunch, I grabbed the water bottle. No drinking water today—the water was a solid chunk of ice. This often happens on cold days like today.

6. I took my insulated engine cover off the Tern and placed it in the baggage compartment. I took off my snowshoes and stored them away. It was now 2:45 PM as I crawled in the Tern, pushed the throttle in halfway, and then started my trusty Tern. It roared alive at first crank. Merrill Field was 30 minutes away; however, I planned to stop and land on several lakes on the way home. I have always liked to make several landings on a flight from home base to keep my proficiency levels high.

7. I flew across Big Lake and landed on a smaller lake just to the south. I got out of the Tern and looked around at the snow conditions on the lake, the cabins and the mountains in the distance. There was nothing more enjoyable flying and being able to land in so many places. After a short time on the lake, I got back in the Tern and flew south to Goose Bay. I went in and landed here on the snow-covered wetlands. This was close to Knik Arm with a great view of the Chugach Mountains.

8. I got back in the air again; it was now 3:35 PM and the sun was fading away on the western sky. The temperature took a nose dive and I'm flying at minus 20 degrees Fahrenheit. I was not cold because I was warmly dressed and my heater gave off enough cabin heat to keep my body core warm. However, I piloted my aircraft wearing gloves to keep the fingers and hands warm. I'd have time to land on one additional lake before flying back to Merrill Field. It would be Twin Island Lake, which was only 10 air miles from Merrill. The snow was velvety smooth and the landing could

hardly be felt. There were really nice cabins here, accessible in the summer by floatplane and in winter by ski-equipped airplanes. It was cold here at minus 22 degrees Fahrenheit and I felt the cold stinging my face. I stayed here only a few minutes and flew off the lake. Now I proceeded to Merrill and wrapped up another typical winter flying day although this one was a little colder than most. I arrived back at Merrill at 4:10 PM only about 10 minutes before sunset. I needed to get back to Merrill before sunset as the landing strip has no lights and it is very difficult to land in twilight and almost impossible to land in the dark. I made it back and parked. It would take about one hour to put the Tern to bed. The darkness which was coming fast was not a problem as our parking apron has really good overhead lights. The lights automatically come on at twilight and they are already on and providing plenty of light, so this would not be a struggle. First chore was to place my electric heater inside the cowling so it would be ready for my next trip. Then I placed the insulated engine cover over the cowling. Next, I needed to use a fulcrum and lever to lift the front and rear part of both skis. Under the skis I place 2-by-4s to keep the skis from freezing to the snow. Then nylon covers needed to be placed over all horizontal surfaces of the Tern to keep snow and frost off. Last chore is to tie the Tern down so that strong winds won’t move it around.

MEMORANDUM 15

SUBJECT: Cross Country Skiing in the Willow Hills

March 15, 2013

1. This March day in Anchorage was sunny, low winds, and with an ambient temperature of 25 degrees Fahrenheit. This will be a grand day to fly 50 miles north of Merrill Field for a ski tour in the Willow Hills. I fly northwest across Knik Arm at 1:35 PM and turn north toward Big Lake. The winds are blowing 10-15 mph from the northeast. There is light turbulence here; however, the Talkeetna Mountains up ahead will likely block these winds by the time I arrive in the Willow Hills. The Willow Hills are a large plateau above tree line at 2,500 to 3,500 feet ASL comprising about 6,000 acres. I am looking for a place to land near the Talkeetna Mountains on the northeast side of the Willow Hills. I find a slightly sloping area and go in and drag the landing area to check on snow conditions. This area is smooth and the skis are not sinking into the snow more than 6 inches. I go in and land to the west with a 4 mph tail wind. I make a left turn into my ski tracks for a takoff into the wind. I shut the engine down and cover it with my insulated cover. My altimeter shows the landing elevation is 3,250 feet ASL.

2. I take my wooden cross country skis and bamboo ski poles out of my cargo bin. I place the toe of my boots in the pin bindings on the skis. A clip holds the ski on the boots. I grab my day pack and place it on my back. I go skiing for an hour and a half. I ski up a small hill. The skiing is excellent as the skis are sinking only 4” into fresh powder snow. Underneath the powder snow is a firm snowpack. The ambient temperature is a comfortable 15 degrees Fahrenheit. The day is sunny with low winds—2 to 4 mph out of the east. There could not be a better day for cross country skiing or a more peaceful place with absolute solitude than the Willow Hills with the Talkeetna Mountains as a backdrop. The snow-covered mountains in the Alaska Range 90 miles to the northwest are plainly visible. McKinley, Hunter, and Foraker are the big three that dominate the mountain range.

3. When I arrive back at my airplane, I check the engine temperature and see that it has decreased from 150 to 130 degrees Fahrenheit while I was skiing. It is still plenty warm and I'll have time to eat lunch before continuing my flight back to Merrill Field. After eating lunch, I take the engine cover off and store it away in my cargo bin. My takeoff from the Willow Hills was routine. On the way back to Merrill, I go in and drag several landing places on frozen lakes. They are all hard and the landing gear is rattling. I don't land at any of these places as this is hard on the landing gear. I continue onward and land back at Merrill Field at 5:10 PM.

4. Cross country skiing is one of my favorite sports and Alaska has some of the best environments for this type of skiing anywhere. A skier can select outstanding snow conditions throughout the winter in forested lowland, hill, mountain, or glacier environments. There is no sport where one obtains such a complete workout as with cross country skis. There is also the benefit of the tremendous ease in moving across vast tracks of terrain. Climbing mountains is several fold easier with skis when compare to climbing on foot in summer.

5. Most consider cross country skiing a northern European invention that started in Scandinavia about 5,000 years ago. A pictograph in a cave in Norway 4,000 years ago shows a person on skis. In the 1960s a ski relic was found in a peat bog in northern Asia that was dated back 8,000 years. In recent years older pictographs and stone carvings have been found in the Altay Mountains in Central Asia that go back to at least 10,000 years and perhaps earlier. What a history for my beloved cross country skiing.

6. I learned to cross country ski in Alaska in Fairbanks in the early 1970s. Wooden skis and bamboo poles were used in that time period. My first skis were made in Norway. In later years, after cross country skiing became more popular, the hickory supply for making skis began to dwindle. Newer skis and poles were being made from fiberglass. I bought two pairs of the newer skis; however, I never liked them near as much as my wooden counterparts. They were always too slippery no matter what wax I used. I still have 6 pairs of wooden skis and select the pair needed for each occasion. You'll need a wider ski with more surface area for ski touring carrying a backpack up to 70 pounds. In the mountains above tree line with

hard wind-packed snow, skis with medal edges are required so that the skis grip and do not slip. I have learned from the Norwegians that wax is not the best answer for preparing ski bottoms. Many Norwegians use only pine tar on the ski bottoms. Hot pine tar is applied by a heating torch as the tar penetrates the wood. Pine tar creates a tremendously flexible ski bottom that does not slip with multiple snow temperatures. On a few occasions, certain temperatures may cause the skis to be a little bit slippery. This is not a problem—all you have to do is to concentrate and improve your technique and the slipping will come to an abrupt halt. Out of shape, weak physical condition, and sloppy techniques cause most of the problems with losing traction while cross country skiing.

7. I learned to cross country ski in the mountains after joining the Alaska Alpine Club in the early 1970s in Fairbanks. We would drive 130 miles southeast on the Richardson Highway to the Alaska Range for weekend adventures including skiing, climbing, and camping overnight in tents. We would not go if forecasted temperatures were below zero Fahrenheit. However, temperatures often dropped well below zero several times after we were already there. One occasion I'll never forget is the 8 mile ski trip four of us made up the Canwell Glacier to an elevation of about 5,000 feet ASL. It was not real cold at 10 degrees and the wind was nearly calm. We set up our tents in the middle of the glacier. When we awoke in the morning, the wind was howling down glacier at about 15 to 20 mph and the temperature was 45 below zero. That was COLD. We all dreaded taking down our tents and loading our camping gear under these harsh weather conditions. It was slow and painful but we all endured the hardship. Skiing down the glacier was not as difficult because we had the heavy packs and we skied at a brisk pace that soon warmed us up. We were also lucky that the wind was to our backs going out.

8. The Northern Lights (*Aurora Borealis*) in Fairbanks in winter are some of the best in the world. Large numbers of Japanese tourists fly in to Fairbanks and stay a few days to a week in February and March when the Northern Lights are almost a nightly occurrence. Cross country skiers take full advantage of these colorful bright lights at night. I vividly remember skiing with no head lamp when the natural lights were out. Temperatures would be 10 above zero to 20 below zero at that time of the year. Fairbanks

has many miles of ski trails, most are through forested tracks of land. There is nothing as spectacular as a ski trek at night when the Northern Lights are in full force dancing across the sky in many different colors.

9. Anchorage's Fur Rendezvous (Fur Rondy) is one of the largest winter festivals in North America. It is held in late February each year. The Fur Rondy World Championship Sled Dog Races are held along with other winter activities. Dog teams and their mushers complete 3 high-speed, all-out 25–mile loops over 3 days with the fastest elapsed time the winner. I took advantage of this 25-mile trail one winter during Fur Rondy when I skied the 25 miles in one afternoon. I remember that I was not real tired after skiing all those miles.

10. Alaska is fortunate to have America's all-time cross country ski champion in Anchorage's Kikkan Randall. Kikkan, a three-time Olympian, has been on the World Cup Cross Country Ski Tours in Europe for the past several winters. Kikkan won the World Cup sprint event in Lahti Ski Games on March 9, 2013 in Lahti, Finland which was her fourth World Cup win for the season and the 11th of her career. This win clinched the 2013 season's sprint crown for Randall—her second year in a row. As Nordic skiing royalty, Randall received her crystal globe as the World Cup's overall sprint champion for the second straight year, by none other than, King Carl Gustav of Sweden. Randall received another milestone in 2013 when she became the first American women to capture third place in the World Cup cross country ski standings. The overall standings combine a skier's results in both sprint and distance races. Randall, 30, ranked No. 1 in the sprint standings and No. 10 in the distance standings, and her combined results placed her third overall. Last year, Randall finished fifth overall. Kikkan works very hard at training to be the best athlete she can be and is a phenomenal role model for women cross country skiers in Alaska, the Lower 48 states, and around the world.

MEMORANDUM 16

SUBJECT: Safety When Moving on Glaciers

January 5, 2013

1. Storms in early winter provide adequate amounts of snow to fill in many small crevasses on glaciers. These so-called snow bridges are most often strong enough to support a man on cross-country skis or snowshoes and a ski-equipped airplane during the winter when the snow particles have been exposed to low temperatures to strengthen them. It is important to understand the pressure placed on snow bridges with different types of conveyance.

2. Table 1 below shows the moving or walking surface pressure in pounds per square inch for a horse's hoofs; a dog's feet; and a man's winter boot, snowshoe, and ski. In addition, the moving surface pressure is shown for my airplane on skis. It is difficult to compare dissimilar types of conveyance. Horses and dogs, unlike humans, walk with two feet on a surface at a time. Humans, while walking, will have only one foot on a surface at a time. Furthermore, humans momentarily place full weight on the heel while walking. This smaller footprint (the heel) further increases the pounds per square inch for the foot by three times. A galloping horse and a running dog and human will double or triple the surface pressure when compared with the walking pressures.

3. The data show that walking on glaciers with winter boots generates nine times more pounds pressure per square inch than walking on glaciers with snowshoes. Common sense dictates that after landing on glaciers you should put on snowshoes or skis before moving away from your aircraft. The calculations also show that your taildragger is the safest conveyance on the glacier. This is due to the large number of square inches on the two main Landes 2500 skis (1904 square inches) and the Landes tail ski (140 square inches) which totals 2,044 square inches. The weight of my loaded Tern with two passengers is about 1,600 pounds. That turns out to be only 0.8 pounds per square inch when the taildragger is parked or double that number (1.6 pounds per square inch) when moving on a glacier. It is great

to know that the taildragger is the safest of most conveyances on glaciers and therefore it has the least chance of punching through a snow bridge and falling into a crevasse.

4. It is important to be cautious and to take measures in reducing chances for falling into a crevasse. It can be a very difficult task pulling a person out of a crevasse. Prevention is a prudent consideration. Pilots who land their airplanes on glaciers should carry the necessary equipment for extracting a person who has fallen into a crevasse. The equipment includes a climbing rope (9 or 11 mm diameter and 150 feet in length), ice ax, carabiners, pulley, Jumar ascenders, aluminum snow anchors, and a nylon seat harness. Training for extracting a person from a crevasse is also highly recommended.

Table 1. Ground Pressure Applied by Different Types of Conveyance*

Conveyance	Pounds/Inch^2
Horse (1,500 pounds with weight on 2 hooves)	60.0
Man (winter boot with weight on one heel)	20.0
Dog (75 pound dog with weight on 2 feet)	12.0
Man on Cross-Country Skis (weight on one ski)	2.3
Man on Snowshoes (weight on one snowshoe)	2.2
Arctic Tern on 2 main skis and tailwheel (weight on all skis)	1.6

*Pressures calculated for animals walking and airplane moving over a snow-covered glacier.

MEMORANDUM 17

SUBJECT: Density Altitude Chart for Ski Landings in Alaska

November 10, 2012

1. Density altitude is rarely a problem during the summer months in Southcentral Alaska because of cool summers with temperatures in the 50 to 70 degree Fahrenheit range and most landings being made in valleys with low to moderate altitudes. This means you don't need to calculate density altitude for most summer operations.

2. In the winter, aircraft may be landing at higher elevations because many places are available for landing ski-equipped aircraft. The density altitude chart below is developed for landing operations on skis during the winter. The chart shows proposed data based on Standard Atmospheric Pressure (29.92 inches of Mercury) and Standard Temperature at the selected landing location. The chart will help you understand how low winter temperatures greatly reduce the density altitude. When you land on Kahiltna Base Camp on Mount McKinley at 7,200 feet; at 8,400 feet at the top of Knik Glacier; or on the plateau near Mount Spurr at 10,000 feet—make sure you have a cold day (zero degrees Fahrenheit or colder) to reduce the density altitude. See the results in the chart.

3. To correctly determine the precise density altitude in your selected landing place, you will have to set your altimeter at 29.92 inches and read the current pressure altitude close to where you plan to land your aircraft. Then you'll need to obtain the outside air temperature (OAT). Use a density altitude chart to plot your precise density altitude with your inputs of pressure altitude and OAT. If you are landing at high elevation on a day with high density altitude, attempt to take off downslope. The distance required for takeoff is reduced by half in taking off on a 20 percent slope.

Density Altitude Chart for Ski Landings in Alaska

Landing[1] (Feet)	Density Altitude[2] (Feet)						
	-20° F	-10° F	0° F	10° F	20° F	30° F	ST[3]
10,000	6,900	7,800	8,600	9,200	9,900	10,500	**22°F**
9,500	6,000	7,000	8,000	8,600	9,200	9,900	**25°F**
8,400	5,000	5,800	6,400	7,200	7,800	8,400	**30° F**
7,200	3,800	4,400	5,100	5,700	6,300	7,000	**34° F**
6,200	2,200	3,000	3,800	4,500	5,200	5,800	**38° F**
5,600	-500	800	3,000	3,700	4,300	5,000	**40° F**
3,200	-1,800	-1,000	10	800	1,200	2,000	**48° F**
2,000	-3,200	-2,200	-1,500	-800	0	700	**51°F**
1,000	-4,500	-4,000	-3,000	-2,000	-1,200	-800	**55°F**

[1]Elevation where you plan to land your aircraft. Data also used for pressure altitude.

[2]Density Altitude based on Standard Atmospheric Pressure and Standard OAT.

[3]Standard Temperature for selected landing elevations.

MEMORANDUM 18

SUBJECT: Whiteout and Flat Light

June 3, 2008

1. Reference: *A Pilot's Guide to Aviation Weather Services in Alaska* published in July 2006 by the Alaska Aviation Weather Unit of the US National Weather Service (NWS), Anchorage, Alaska. Note the definitions of *Whiteout* and *Flat Light* presented on the back of the brochure.

2. The definition of a whiteout as presented in the NWS guide is unequivocally incorrect. First of all, whiteout is one word, not two words as the guide portrays. Second, defining a whiteout as being caused by blowing snow is absolutely without foundation. Blowing snow has nothing to do with a whiteout. The terminology for naturally blowing snow is a *Blizzard*, not a whiteout. Whiteout is an optical phenomenon in which the snowcovered terrain blends into a uniformly dull sky reducing the visibility of shadows, clouds, the horizon, and so forth and one's sense of direction or distance[1]. Flat light is no more or less than another common word for whiteout. Whiteout and flat light are used interchangeably.

3. The misuse of the word whiteout is a gigantic embarrassment to Alaskans and also to mountaineers from around the world who come to Alaska to climb our challenging mountains. These individuals are intimately aware of whiteout conditions on Alaska's glaciers and they would cringe at the NWS definition. The greatest difficulty in navigation on Alaska's glaciers is the optical phenomenon caused by low cloud layers and light with greatly reduced visibility. This causes problems in navigation because it is difficult or impossible to discern or choose a proper route when one can not see rises, depressions, holes, crevasses, and other obstacles on the surface of the snow-covered glacier. Whiteout conditions on glaciers in Alaska are common occurrences. Wind is for the most part a nonfactor in navigation on glaciers. If the wind is blowing hard enough to blow snow around, a mountaineer or pilot would probably not be active. The greatest challenge for a pilot is a mild whiteout, which many pilots will not recognize, and they would land in such conditions. They would all too quickly find out that

a snow bank or a deep depression was concealed by the mild whiteout. After touching down on skis, the pilot would only then see the snow bank—too close to avoid. Pilots in Alaska will land on glaciers and a few will run into a hidden snow bank or a depression because of mild whiteout conditions.

4. For the sake of individuals knowledgeable about the correct definition of a whiteout, please correct this deficiency in the brochure. We don't need to confuse or complicate matters for individuals who are learning or ones needing instruction.

[1]*Webster's New World College Dictionary*, 4th Edition. 2004. Wiley Publishing Incorporated, Cleveland, Ohio.

MEMORANDUM 19

SUBJECT: Atypical Pilots Flying Taildraggers in Alaska

April 15, 2013

1. Airline Transport Pilots (ATPs) fly taildraggers in Alaska after retiring from a professional aviation career with a commercial airline. Why do retired ATPs move to Alaska and fly taildraggers? First, flying taildraggers and landing off-airport in remote places is one of the most challenging, interesting, and enjoyable flying experiences in all of aviation. The inspiration of flying Alaska with its vast uninhabited mountains, glaciers, and fjords and magnificent wildlife is also a powerful motivating force. And thirdly, the camaraderie of flying in Alaska is the best that can be found anywhere. With all three of these aviation attributes—who would not enjoy flying Alaska?

2. Recently, I have noticed that there are active ATPs that are flying taildraggers in Alaska. These ATPs are flying commercial aircraft based in the Lower 48 states. They have homes near the aviation hub where they fly from and a few have a second home in Alaska. Their commercial airline working schedule with lots of time off and their high compensation rate allows for this to be practical. I know of one ATP flying for a commercial airline in the southeastern states that not only has a home in Anchorage but owns a 5 acre parcel with a beautiful cabin on a lake northwest of Merrill Field. He uses a Super Cub on floats in the summer and skis in winter to fly to his cabin retreat with his wife and dog in tow. This is the ultimate aviation lifestyle. Not only living your professional aviation dream with having full time employment but having the best retirement-type of aviation experience in mid-life that is possible. It does not get any better.

3. Commercial pilots in Alaska that fly aircraft for regional airlines also fly taildraggers. These pilots have privately-owned taildraggers and fly them when they are not working on their commercial flying occupation. This flying combination provides the better of two worlds—full time employment in a career field and flying and enjoying the best type of aviation experience on your own time. These commercial pilots, like the

ATPs, have lots of time off making the choice of flying taildraggers in Alaska a reality. What a fabulous aviation career this is?

4. There are still other pilots from the Lower 48 states and from European countries that fly taildraggers in Alaska. These are pilots that typically have a Super Cub stored in a hangar in Alaska. They will fly to Alaska several times a year on a commercial airliner and spend a week or more flying their Cub in wild Alaska. These pilots deserve very high marks for they have done their homework. They have learned the true value of flying in Alaska. What Alaska has to offer does not exist elsewhere and they want to take advantage of it. They also want to be part of Alaska’s rich aviation legacy.

MEMORANDUM 20

SUBJECT: Creative Technique for Landing Your Bush Plane on a Gravel Strip

February 25, 2013

1. Alaska Dispatch published an article in their Bush Pilot Section on this subject by Alaska Pilot Matt Keller on December 31, 2012. This is a classic example showing creative thinking by an Alaskan bush pilot on how to land your aircraft on a gravel strip. Note that Matt did not endorse this landing technique as a remedy for all landings. With lots of experience and a high level of creativity, you will have a slightly modified or unique technique for each landing. Below is Matt Keller's intriguing article.

How to: Techniques for landing your bush plane on a gravel strip by Matt Keller

December 31, 2012

This photo shows me touching down on a nice 500-foot airstrip. You can see I just touched down because the rocks flying from my impact with the ground.

Notice my flaps are already up and I have not even rolled 10 feet. That probably means that I was flying a bit fast and retracted them while I was still 6 inches off the ground.

I do this subconsciously for a couple of reasons.

Dumping the flaps in-flight allows me to hit my touch-down point because it drops me out of the air like a rock. It's incredibly important to land on the very end of the strip to allow maximum distance for braking. This is ideally done by reaching your critical angle of attack at precisely the right moment.

Others prefer to fly their aircraft into the ground at the touch-down point, a technique which is usually bouncy. Or you can cheat and dump your flaps in flight over the top of the touch-down point.

The reason I chose to cheat is that it allows a faster final approach for added control and increased margin to the stall. It also improves visibility

over the nose of the cub and it keeps my tail up, so it does not get pounded by the rocks kicked up by my huge tires. A 500-foot airstrip is plenty long enough to dissipate the added energy of a slightly fast touch down and the added margin on final is always nice.

The rocks on this airstrip are no small factor. If I touch down in a 3-point attitude on rocks like the ones in the photo, my horizontal takes a nasty beating, costing me hard-earned money. But like I said, dumping the flaps is totally sub-conscious. My left arm just does it when my brain thinks its best.

So is this the absolutely best way to land? It was the best way for this scenario and I probably used a slightly different technique at the next location.

Matt Keller is the owner and operator of Blue Ice Aviation, a small air taxi in Alaska. Matt provides photos, stories, and flying techniques on his blog at BlueIceAviation.com.

MEMORANDUM 21

SUBJECT: Building Quality Airstrips in Alaska

August 16, 2009

1. The Cooperative Extension Service (University of Alaska) is trying to persuade pilots who are building airstrips to construct and maintain a grass-covered airstrip. Most airstrips in Alaska have a gravel base. The Cooperative Extension Service claims that grass-covered airstrips will save planes by avoiding problems caused by gravel.

2. From over 30 years of flying in Alaska and landing on all types of landing surfaces, it is abundantly clear that gravel surfaces are far superior to all the other types. This does not include paved surfaces, as this belongs in another discussion.

3. Anchorage International, Merrill Field, and Palmer Airports all have paved runways for commercial aircraft. These airports also provide unpaved airstrips for small aircraft. All of the unpaved airstrips have a gravel surface. The government can afford to build whatever type airstrip they want. They build gravel airstrips because they are superior to other surface materials, including grass. In addition, pilots support building gravel airstrips. Picking up gravel on these carefully prepared airstrips is a rare occurrence because the gravel is washed, graded, and sized. The proper size gravel is sufficiently heavy that in normal aircraft operations the propeller and tires do not pick up the gravel.

4. Grass-covered airstrips are expensive to build. The terrain has to be leveled, contoured for drainage, and maintained for months by mowing throughout the summer growing season. These airstrips are often soft, especially when wet due to prolonged periods of rainfall. If drainage ditches are not well designed, flooding occurs. Ruts and muddy conditions can occur if strips are repeatedly used when wet.

5. All the problems with grass-covered airstrips mentioned above are eliminated with gravel. One hour after long periods of prolonged rainfall,

gravel strips have drained and the surface is firm and free of water. No splashing water and mud on your aircraft. No rutting on the surface of the airstrip. No flooded areas on the airstrip. Takeoffs and landings are shorter on gravel because of the firmer surface. Visibility of the ground conditions is far superior with gravel when compared to grass-covered airstrips which often cover-up obstacles such as logs, rises, swales, holes, and others.

6. The Cooperative Extension Service should not be promoting the building of grass-covered airstrips for aircraft use because of the cost and the inherent problems associated with grass strips. It is significantly more appropriate to promote the building of gravel airstrips in Alaska. Grass, however, may still have a role to play. The Cooperative Extension Service could research the best types of grasses that grow in a thin cover or scattered pattern over pit run gravel surfaces on established airstrips. This would bind and hold down the gravel so that it would be unlikely to get airborne and damage aircraft during takeoff and landing operations. This would provide relief for airstrips built with pit run materials. Pit run comes in many sizes and the rocks that can be picked up by aircraft are usually present. Pit run is commonly used on airstrips because it is readily available and the cost is low (usually paying only for loading and hauling).

7. Picking up gravel by the airplane propeller or tires while landing or taking off on gravel surfaces is a minor nuisance each and every pilot has to learn to deal with in Alaska. If you avoid it on your home landing field by having other surface types (grass, pavement), you will still have to live with it every day when landing off airport on river gravel bars and on beaches all over Alaska. A skilled pilot in Alaska has learned over time how to greatly reduce the damage of sucking up gravel into the propeller or setting gravel in flight by aircraft tires. Soft tundra tires help tremendously in this matter. The taller tundra tires also provide greater propeller clearance and reduce the likelihood of picking up gravel by the propeller. Learning the proper ground maneuvering of an aircraft is essential in avoiding gravel damage to your aircraft. And every so often, even experienced pilots, will nick the propeller by a rock. This is not the end of the world. You just file off the nick and properly dress down the propeller. Remember, propellers don’t last forever. Every few years or sooner, a propeller will need to be taken off the

aircraft and be reconditioned. This will effectively clean up all the nicks and balance the propeller. Eventually, the propeller will need to be replaced.

8. From the above discussion in paragraph #7, one can understand that landing on gravel in Alaska is a way of life. My aircraft is parked on a gravel strip and taking off and landing on it is my least concern or worry. The gravel bars on rivers or the ocean beaches are a much greater challenge in landing and takeoff without picking up gravel or sand. Nevertheless, landing on gravel and beaches is what provides much of the access to remote places in Alaska. If you avoid or don’t land on gravel, you have eliminated most of the access to the backcountry. If this is reality, we would not need Piper Cubs or all the other taildraggers we have in such plentiful supply.

MEMORANDUM 22

SUBJECT: Letter to Alaska DOT&PF Regarding Closing Whittier Airport*

Alaska Department of Transportation and Public Facilities
Central Region Planning
P.O. Box 196900
Anchorage, Alaska 99519-6900

Re: Whittier Airport Proposed Closure

December 6, 2004

I would like to provide testimony concerning the proposed closure of Whittier Airport. Mr. Kip Knudson, Aviation Deputy Commissioner, DOT/PF provided an e-mail message dated November 23, 2004 to address the reasons why the state wants to close Whittier Airport. My comments are primarily to counter Mr. Knudson's reasons for airport closure. They are not based on common sense or facts. In addition, closing the airport would place a great burden on many pilots flying in Prince William Sound by taking away a very important relief landing area when Portage Pass is determined to be not flyable because of severe weather conditions.

The comment that closing the Whittier Airport will save lives and that the airport is the greatest risk to pilots and passengers is a good example of not understanding aviation users in Alaska. I am not aware of excessive airplane accidents or people killed at Whittier Airport during the past 25 years that I have been flying out of Merrill Field. Where are the facts? In addition, experienced tailwheel pilots who fly in Southcentral Alaska will not have a problem landing at Whittier. The Whittier Airport is magnitudes easier for landing than beaches, gravel bars, mudflats, and other short and rough landing places. Routinely landing on short and rough places provides high proficiency. The airport is plenty long and wide enough to be safe. I do recommend that it be used as a one-way airstrip, landing across the water on the approach and taking off toward the water. For experienced tailwheel pilots, this is very safe and a routine procedure on many of the airstrips that

we use. Instead of saving lives, I firmly believe that the State would be endangering lives by eliminating a very important relief airport that may be needed when pilots approach Portage Pass in marginal weather conditions and determine that it is not safe to continue. If the pass is not flyable, Mr. Knudson recommends that a pilot should turn around and fly back to Chenega, Tatilek, or Valdez. I can assure you that the least desirable and most dangerous option is to turn around and attempt to fly back 75 miles across Prince William Sound to one of these airports. When the weather is deteriorating behind you as you fly west, turning around at Whittier and attempting to find your way back to one of these airports is certainly not advisable and often is not feasible.

Over the years, Whittier Airport has provided many pilots a safe place to land when weather conditions are too marginal for a safe flight through Portage Pass. If the airport were not available for use, many pilots would have no reasonable option but to continue in very marginal conditions in an attempt to fly through the pass. We will never know how many lives Whittier Airport has already saved. The fact is that there have been very few serious accidents (I can't recall any in over 20 years) from pilots either flying through Portage Pass or landing at Whittier Airport. This strongly indicates that Whittier Airport is playing a dominant role in keeping aircraft operations through Portage Pass safe. With that kind of amazing history, why would the State recommend closing such a vital landing area? Whittier is a poorly maintained airport so the State is not spending unavailable resources in its upkeep.

A pilot at the public hearing in Anchorage on December 2, 2004 described what he would do if he arrived at Whittier from the east in marginal weather and he could not fly through Portage Pass. This is assuming the State closed Whittier Airport. He said that he would either land in the Alaska Railroad Yard in downtown Whittier or on the road leading out of Whittier. These are not good choices and aircraft accidents are certain to result from the difficulty. His concluding statement was that lawsuits would certainly be filed as the accidents would be directly correlated with closure of the Whittier Airport. For the record, State DOT officials at the meeting said they are not aware of any, not even one, lawsuit stemming from aircraft accidents at Whittier Airport (the airport has been there for at least 35 years). Does this make a statement! It is obvious that it does.

For all the reasons discussed above, it is apparent that Whittier Airport serves an important and vital role as a relief airport for aircraft flying through Portage Pass. The facts are that it has served that function exceedingly well in the past, almost without flaw, and it must continue to be available in the future. There are many pilots from Kenai, Soldotna, Anchorage, Birchwood, Palmer, Wasilla and other places that fly their aircraft through Turnagain Arm to Prince William Sound through Portage Pass and then fly back again out of the Sound toward the west. These pilots depend on the availability of Whittier Airport being available for landing when weather conditions are marginal and flying through the pass is not safe. Please leave the Whittier Airport open.

William A. Quirk, lll, P.O. Box 212545, Anchorage, Alaska 99521

*Pilot’s testimony helped to convince Alaska DOT&PF not to close Whittier Airport.

MEMORANDUM 23

Subject : Aviation Experience for Young Pilots Visiting Alaska

February 22, 2007

1. I may not be the best pilot in Alaska to advise you on your commercial aviation quest. Although I have owned and operated tailwheel-equipped aircraft in Alaska for over 25 years (since 1979), all my flying has been oriented toward noncommercial off-airport operations (bush flying). See the attached Alaska's Modern-Day Bush Pilots.

2. I believe every young pilot getting started in an aviation career would benefit a great deal by spending time flying in Alaska. One pilot I know who is a retired US Air Force jet pilot/training instructor and active airline transport pilot refers to Alaska as the aviation center of the world. The reason for this designation is that aviation plays a much larger role in Alaska than most anywhere else. As a result, aviation is robust, diverse and deeply woven into the everyday fabric of living in Alaska. Large numbers of exceptionally experienced pilots provide a hotbed for aviation inventiveness. Few places offer the daily challenges of flying in remote and uninhabited lands such as are found in Alaska's vast terrain, for example, huge mountains, vast forested valleys, enormous tundra expanses, mammoth glaciers and ice fields, and fjords.

3. Most commercial flying jobs in Alaska require a minimum of at least 500 Alaska hours as a pilot in command. Renting airplanes and flying on your own time is an option; however, it is prohibitively expensive for most pilots.

4. More and more pilots are coming to Alaska each year to attend the Alaska State Aviation Trade Show and Conference. This is held every year in the FedEx maintenance hangar at Anchorage International Airport. This year's event is scheduled for May 5–6, 2007. The trade show is about flying in Alaska, industry trends, new products, safety and more. Two hundred sixty nationwide displays of aviation products and tools will be presented in booths with experts available for discussion. New aircraft will be displayed

both inside and outside the hangar. This is Alaska’s premier aviation event. Expected attendance in 2007 is more than 21,000.

MEMORANDUM 24

SUBJECT: Arctic Tern Advocate

May 10, 2008

1. I attended the Alaska State Aviation Trade Show and Conference on Saturday and Sunday, May 3 and 4, 2008 at the FedEx Maintenance Hangar on Anchorage International Airport. I was disappointed when I did not find a booth for Interstate Aircraft Company, which has provided a display for the past several years. Nevertheless, I was elated to find out from Bill Diehl at the trade show that the amended Type Certificate for the new Arctic Tern has been approved by the FAA in 2007 and that Interstate Aircraft Company was bought by Mr. Charles E. Nearburg.

2. My interest in the subject comes from the Arctic Tern I purchased on August 8, 1997. I have logged 1,468 hours in the Tern as pilot in command in Alaska during the past 11 years. The Arctic Tern is on Bushwheels in summer and Landes skis in the winter. The Tern has excellent offairport (bush flying) capability and has allowed me to explore and safely land in hundreds of remote areas. Many of these landings are first-time events where no aircraft has landed before. The Tern is a sturdily built aircraft and a marvelous flying machine. It is very stable in the air even at near stall speed. It is easy to fly and it handles extremely well even in gusty wind conditions. The huge flaps, which help to generate a slow stall speed (near 32 miles per hour), and the excellent visibility over the cowling allow great landing capability on short landing surfaces on river gravel bars, ocean and lake beaches and mudflats (when dry), grasscovered sod, tundra, and snow-covered surfaces in winter on glaciers and ice fields on skis. The extra space in the cockpit makes the Tern very comfortable and a pleasure to fly. The large baggage area is a great asset, not only for the large cargo space but also for the large door, which allows the easiest loading and unloading of large items of any of the tandem taildraggers.

3. I am very excited and optimistic that the new Arctic Tern will become a reality and that it will soon be built and available to pilots flying the remote backcountry. Manufacturing the new Tern will hopefully make it possible

for all of us with the original Tern to have a ready supply of parts when we need an upgrade or replacement due to damage to our aircraft. Keeping the Tern alive is great news to all of us who fly them. Approximately 14 pilots are still flying the originally built Terns in Alaska. Seven pilots are flying the Arctic Tern in the continental US. Several other Terns are flown in foreign countries.

4. Alaska will play a crucial role in selling the first newly built Arctic Terns. This is because the first Arctic Terns were being built and flown in Alaska, and because of the Tern's outstanding flying characteristics in the bush. This is an aircraft that serves Alaska well. Pilots flying the new Tern after a short period of time will be shocked at the great flying characteristics of the airplane and its suitability to access remote lands in Alaska. With highly respectable pilots in Alaska endorsing the Tern, sales will then spread elsewhere, especially in Canada, continental US, and foreign countries.

5. The Alaska State Aviation Trade Show and Conference sponsors the Alaska Airman's Association annual airplane raffle. Dan's Aircraft on Merrill Field built a Piper Super Cub for the 2008 raffle. Providing an airplane for the raffle presents an excellent opportunity to show and sell new aircraft. Attendance for the trade show was over 21,000 in the year 2007. This is a tremendous amount of exposure in the Alaskan aviation community. Inquiries with the Alaskan Airman's Association are going on now for who will be chosen for the raffle airplane for the 2009 trade show. I hope Interstate Aircraft Company will offer to build a Tern for the raffle in the future. This would be a very positive step forward for the future of the Tern.

6. When talking with Bill Diehl (designer and builder of the Arctic Tern in Anchorage from 1975 to 1985) at the trade show, I mentioned my Arctic Tern ski landing on the Kahiltna Glacier at 7,200 feet ASL at the Mount McKinley Mountain Climbing Base Camp on March 28, 2008. Bill countered with his over-the-top flight of Mount McKinley in his Arctic Tern (Lycoming O-320, 150 horsepower) on Easter Sunday. Bill had an oxygen supply and had a difficult time gaining sufficient altitude near the summit to fly over the top of Mount McKinley which is at 20,320 feet ASL. The air at 20,000 feet was thin and the engine had a greatly reduced amount

of horsepower. Theoretically, engine horsepower would be diminished about 60 percent at this altitude. However, the cold air, which was well below zero Fahrenheit, helped to reduce density altitude. Bill said he was circling the peak with flaps employed trying to climb high enough to fly over the peak. He finally climbed high enough to fly over McKinley's summit. When he looked down at the summit when he passed over it, the height above the top of the mountain was only 50 feet. WOW! What an accomplishment.

7. All the best to Arctic Aircraft Company. You can count on many loyal supporters in Alaska. We are pulling for you.

MEMORANDUM 25

SUBJECT: The Chilled Wolf and the Rambunctious Wolverine

December 26, 2010

1. It is just amazing the wonderful wildlife that lives next door to Anchorage, Alaska. On a flight from Merrill Field in downtown Anchorage on December 9, I flew east over a small ice- and snow-covered lake next to the base of the Chugach Mountains. Yes, right there was a beautiful sub adult gray wolf running across the lake. The wolf was light colored, speckled gray and white, and appeared silvery in the bright sun at 2 PM. I circled silver wolf, not up close, but at a distance so as not to disturb her. I wanted to know what the wolf is up to. Silver wolf began digging a small hole in the snow on the lake and then she jumped in and curled up in a circle with her tail wrapped tightly around her body. From the air, silver wolf was curled up into a perfect circle. This was an amazing sight to see and no one would expect to see such an elongated wild animal being capable of curling up into a perfect circle. Why did silver wolf do this? It is all about physics and cold weather. A perfectly round circle creates the smallest body surface area and therefore preserves the most body heat. This wolf was cold and curled up to rest or sleep. The temperature was zero degrees Fahrenheit at 2 PM. The overnight temperature was minus 10 to minus 20 Fahrenheit. Silver wolf probably had not had a meal in several days and was drawing energy from body fat. This would not keep silver wolf near as warm as having fed recently on a freshly killed moose.

2. Another flight in the Arctic Tern was made on December 12 into Ship Creek east of Merrill Field. Dee and his Piper 12 led the way. We flew up Ship Creek and turned east up the North Fork of Ship Creek. At the head of this drainage at 3,000 feet elevation near Moraine Pass, Dee spotted a young wolverine loping across the snow-covered valley. The Chugach Mountains rise up to over 7,000 feet in the North Fork Valley. The wolverine is a spectacular animal that very few people get to see because they exist only in wild, remote areas far away from human civilization. We

were 22 miles southeast of Merrill Field in Chugach State Park. There were no roads or trails in this area.

3. The wolverine is an amazing animal as it lives in Alaska with the cold winters but it does not hibernate. It is active for most of the winter, covering miles and miles of territory searching for food which is primarily animal carcasses. It has an amazingly sensitive nose and can find animal carcasses under several feet of snow. It will dig them out and it almost always has a meal even though other animals have cleaned all the meat off the bones. The wolverine will have a great meal just crushing the bones of a moose and eating the marrow. Wolves and other carnivores usually leave the larger bones whole as they don’t have the powerful jaws of the wolverine. The wolverine does get out of the cold winter weather for short periods from a few days to a week or more by digging large tunnels in hardened snow banks. This is not hibernation, as the wolverine’s body temperature and heart rate are normal while it rests and warms up in the snow tunnel. Then it goes out for a few days to a week or more searching all over again for something to eat in the cold snowy mountains. This is, no doubt, a very tough life.

MEMORANDUM 26

SUBJECT: Chronology of Wolf Sightings on Fort Richardson, Alaska

December 20, 1997

Date	Wolf Sightings in 1997
Aug 2	Large dark gray wolf crossing Bulldog Trail on the South Post of Fort Richardson 1 mile south of Bunker Hill. Sighting was made in a vehicle while driving south on Bulldog Trail. Weight of wolf was estimated at over 110 pounds.
Sep 8	First aerial sighting of wolf pack near den site. Den site was located 1 mile southeast of Bunker Hill in the locality of 2 glacier kettles. Den site was on the west rim of north kettle. Large gray alpha male was sleeping in the bottom of south kettle. Black alpha female was in north kettle with 4 black pups. Female sleeping; pups playing nearby.
Sep 12	Alpha male and female with 4 pups found in north kettle.
Sep 19	Two black pups in north kettle.
Sep 20	Three black pups found in north kettle.
Sep 21	No sightings of wolves.
Sep 23	No sightings of wolves.
Sep 26	No sightings of wolves.
Oct 3	Alpha male and female with 3 black pups in north kettle.
Oct 4	Alpha male and female with 3 pups in south kettle.
Oct 12	Alpha female (black color) found in south kettle.
Oct 15	Alpha female was sighted in north kettle. First snowfall in 1997 was 4–6 inches on Oct. 14.

Nov 2	Two black wolf pups sighted on the west rim of north kettle.
Nov 16	Alpha female with 3 black pups sighted at sunset on west rim of north kettle.
Nov 29	Three black pups sighted at sunset on the west rim of north kettle.
Nov 30	One black pup sleeping in the snow on the west rim of north kettle. Pup was observed as a round ball curled up in the snow. This reduces body surface and conserves heat.

MEMORANDUM 27

SUBJECT: The Wildlife Legacy of Ship Creek

September 20, 2002

1. The Ship Creek drainage in the Chugach Mountains east of Anchorage is a protected watershed comprising 91 square miles (58,240 acres). Ship Creek was first protected in 1919 to safeguard the water supply for the City of Anchorage. Later it was afforded additional protection when the Army in 1941 constructed a timber diversion structure to take water from the creek. In 1952, the Army constructed the currently used Ship Creek dam and reservoir which is a 50-foot concrete structure supplying water for Fort Richardson, Elmendorf Air Force Base, and the City of Anchorage. In the early 1970s, upper Ship Creek was included in Chugach State Park and now has the highest order of protection under a wilderness classification. The long and continuously protected status of upper Ship Creek has precluded road building and vehicular use. This has preserved the wildlife resources and habitat in a natural state since people first lived in Anchorage to the present time. The only human activity in upper Ship Creek has been light recreational activities including hiking and backpacking, cross-country skiing and winter camping, and hunting on foot or horseback for moose and Dall sheep.

2. The core of wildlife resources in upper Ship Creek is only 12 air miles from downtown Anchorage. No other modern and progressive city the size of Anchorage can claim such a wildlife spectacle so close to an urban area. The vegetation resources in the Ship Creek drainage are excellent habitat for a wide array of Alaska's most magnificent wildlife. The Ship Creek drainage provides summer, fall, and early winter habitat for slightly over 200 moose. Predators associated with the moose herd include a wolf pack that remains year round in the upper Ship Creek drainage. Other predators found in Ship Creek are the lynx, pine marten, hawks, owls, and the golden eagle. Predators–Scavengers include 15-20 brown bears, a moderate density of black bears, wolverine, ermine, raven, and magpie. Other large mammals found in upper Ship Creek are Dall sheep. The population of sheep in Ship

Creek has been as high as 375 and has averaged 258 in the early 2000s. Neotropical land birds nest in the Ship Creek drainage in the summer. A magnificent pair of white gyrfalcons was observed by the author on a flight in upper Ship Creek in June 1992. The upper part of Ship Creek supports a large population of beaver. Marmots, red and ground squirrels, and rodents complete the list of resident wildlife found in Ship Creek.

3. To maintain such an abundance and variety of Alaska's treasured wildlife, upper Ship Creek in Chugach State Park and Fort Richardson will need to be continually managed in the future for the long term sustainability of the animals and the habitat.

MEMORANDUM 28

SUBJECT: Wildlife Sighted on Two Flights into the Chugach Mountains

August 25, 2005

1. I conducted two scenic flights in the Arctic Tern on August 22, 2005 to fly a German schoolteacher and her 8-year-old son into the Chugach Mountains east of Anchorage, Alaska. The goal was wildlife and mountain–glacial scenery.

2. The first flight departed Merrill Field in Anchorage at 1PM. The flight plan was to fly a circuit up Eagle River, Whiteout Glacier (over the top), Lake George Basin, Knik River, Palmer, and then back to Anchorage. While flying up Eagle River Valley at 3,000 feet elevation, 4 brown bears were sighted in alpine habitat on Harp Mountain. This unusual sighting of bears consisted of a dark brown sow with three cubs that were 2½ years of age. Cub One was dark brown, the same color as the sow. The other two cubs had a color pattern that was different from the sow and Cub One. Cub Two had a coat of shimmering honey-blond hair on top and along its sides. Its rear end and belly were dark brown like the sow. Cub Three had a muted coat of blond hair on top and along its sides and also had a dark brown coloration on its belly and rear end. These bears were approximately 2 miles from Albert Loop Trail (near the Eagle River Visitors Center) in Chugach State Park.

3. Several groups of mountain goats in small numbers (4–7) were found in upper Eagle River drainage on the north side of the river. After passing over Whiteout Glacier, a black bear was observed on the mountainside in Lake George Basin. Continuing the flight to the southwest end of Lake George Basin, 14 mountain goats were observed on a mountain slope north of Sparrow Glacier. Seven additional mountain goats were observed on an ice-free ridge between the Glenn and Lake George Glaciers. On this same ridge on the Lake George side was a black bear sow with two spring cubs. Thirty-two mountain goats were observed on a west-facing mountain slope near

the lower part of Lake George Glacier. Moose and trumpeter swans were sighted in lake and wetland habitats in the Jim Creek Basin east of Palmer, Alaska.

4. The second flight began at 4 PM. We were able to fly only into the Eagle River drainage because of an approaching storm with high winds building up in the Chugach Mountains. We searched for the four brown bears and found them about a half mile east of the first sighting. We found another brown bear sow with two spring cubs (cubs that are about 7 months old) 1½ miles west of the 4 bears on Harp Mountain. We also sighted 2 single black bears lower down the slopes on Harp Mountain. Thirty-five Dall sheep were found further up Eagle River near Kiliak Glacier.

5. Summary of wildlife observed on the two flights—brown bears: 7; black bears: 6; mountain goats: 66; Dall sheep: 35; moose: 12; and trumpeter swans: 18.

6. The German visitors enjoyed the flights. These flights into the Chugach Mountains are to be cherished for the ages.

MEMORANDUM 29

SUBJECT: Amazing Wildlife Observations in the Eklutna River Valley

May 22, 2008

1. Thursday morning May 22, 2008 was a gorgeous day in Anchorage, Alaska. The day was mostly sunny on the coastal plain; however, thick masses of clouds covered the tops of the mountain peaks east of Anchorage in the Chugach Mountains. A flight could be made underneath the clouds in the Eklutna River valley. The forecasted light winds made it possible to take this flight and to view Alaska's magnificent wildlife. I also planned to land on Bold Airstrip in Chugach State Park 30 miles northeast of Merrill Field. I got the Arctic Tern ready and flew out to the Eklutna River which takes about 20 minutes.

2. Eklutna Lake Campground and Trailhead is on the northwest end of Eklutna Lake. Bold Airstrip is on the other end of the lake and is accessible by land on an 8-mile road reserved for hikers and All-Terrain Cycles. On approaching Bold Airstrip, the thick clouds covering the upper parts of the mountains were sufficiently high so that I could fly under them at 3,200 feet elevation and search for wildlife on the mountain slopes. I flew up the west fork of Eklutna River to the Eklutna Glacier. In this valley I found 6 mountain goats on the right side flying up the valley on steep rock faces. Another ½ mile up the valley was a large black bear on the mountainside. On the other side of the valley was a mountain peak called the Mitre (6,655 feet) which had almost vertical rock cliffs. On these cliffs were 14 mountain goats. Several of the goats were bedded down and surrounded in all directions by seemingly vertical rock cliffs. This was a sight to behold! I wondered how these goats got there and how they would depart. Did they ever slip and fall to their deaths while traversing the steep rock faces? Another large black bear was found further along on a forest-covered mountain slope.

3. Now I flew up the East Fork of Eklutna River. This was one of my favorite river valleys. It had three spectacular mountain peaks (the three Bs) in the 8,000-foot elevation range and many small glaciers in the upper end of the valley. It was also a wildlife haven for Dall sheep, mountain goats, moose, bears, wolves, wolverines, and other small mammals. On the backside of the Mitre were 6 mountain goats on very steep rock cliffs. At the head of the valley near Baleful Peak (7,920 feet) I found 10 mountain goats on rocky cliffs above lower Baleful Creek. Flying down the East Fork Valley, I observed 5 goats bedded down on the mountainside. On the lower slopes of Bashful Peak (8,005 feet) were 8 goats. Beneath the rocky cliffs of Bold Peak (7,522 feet) were 17 goats. Numerous black bears were visible in the east fork of Eklutna River. A majority of the bears were concentrated in a small area halfway up the valley. I found one large black bear on a south-facing mountainside along with a sow and yearling cub. Then I found a sow with two cubs of the year in the valley bottom near a large cottonwood tree. Also in the valley bottom near a lake was another black bear. On a north-facing slope a solitary black bear was found. One additional black bear was located on a mountain slope further down the valley. The wildlife totals for the East Fork were 46 mountain goats and 9 black bears. Dall sheep live in this valley but were not found today.

4. After flying out of the East Fork, I landed the Tern at Bold Airstrip. Chugach State Park (half a million acres) has provided two airplane tiedowns and two picnic tables. This is a great place for camping. I sat in the sun on one of the picnic tables reading the *Anchorage Daily News*. Two Canadian jays came by and I chopped some of my cashews with a Swiss Victorinox. The jays got the cashews and I got some close up images. I hiked down the airstrip to Eklutna Lake, then walked along the lakeshore for a while. Walking back down the airstrip I tossed large stone cobbles off the runway. It was a great day to be there in the sunshine with all the spectacular mountains all around. In my two hours on the ground no one showed up at the airstrip. This is a favorite area for bicycle riders. They often ride from the trailhead parking to the airstrip (8 miles) and farther into the park to Eklutna Glacier which is 13 miles one way. Near Eklutna Glacier at Mile 12 is a large well-designed hut where the riders can stay overnight.

5. I was now flying out of Bold Airstrip with a 10 mile wind off the lake making the takeoff short and rock solid. On the way back to Merrill Field I'll fly the mountain slopes on the north side of Eklutna Lake and search for wildlife. Although there were no large rock cliffs in these mountains, I still found 6 mountain goats and one black bear on the mountain slopes. Farther along about halfway down the lake I flew into a valley and counted 48 Dall sheep in one flock. These were ewes and lambs. I did not find the rams, which should be together in their own band. A little farther down the lake I found 10 addition sheep on the mountainside. About 2/3 of the distance along Eklutna Lake I turned right and flew north up Yuditnu Creek and immediately located a large brown creature on the mountain slope above the creek. It looked like a moose from a distance. I figured I'd better circle and go around again and check this creature because I wanted to make sure what it was. On the next pass I could clearly see that it was not a moose but a beautiful subadult brown bear. It was always so special to locate a brown bear and to circle a few times and see what the bear was up to. This bear was walking upslope searching for food. The bear had a dark brown belly, lower legs, rump, and a brown streak down the upper back, and dark brown on the shoulders. All other areas, the bear's sides and head, were light blonde or honey colored. This was a spectacular color combination and a sight to behold. In this same drainage I found 22 Dall sheep. Flying beyond Eklutna Lake I found several small groups of Dall sheep. These groups of sheep numbered 3, 8, and 4. The group of 8 was a band of rams. The total number of Dall sheep in the mountains on the north side of Eklutna Lake was 95.

6. I returned to Merrill Field and concluded another memorable day of flying into the Chugach Mountains. Wildlife totals for animals observed were 95 Dall sheep, 72 mountain goats, 12 black bears, and 1 brown bear. This makes living here so special and rewarding. Flying in the mountains is highly inspirational and being able to observe such a large number of Alaska's most magnificent wildlife on one flight is remarkable. When I stop flying, I will always have these fond memories that will be everlasting in my mind.

MEMORANDUM 30

SUBJECT: Winter Moose Survey in the Ship Creek Watershed

February 28, 2001

1. An aerial survey was conducted in the Ship Creek Watershed at 12:15 PM on February 24, 2001 to determine the number of moose remaining on their late summer–fall–early winter range. The survey was flown in my Arctic Tern taildragger based at Merrill Field in Anchorage. The weather was sunny with thick layers of fog in Turnagain Arm and along the western slopes of the Chugach Mountains south of Campbell Creek. The ambient temperature was 24 degrees Fahrenheit. The snowpack in Ship Creek was continuous and was approximately 2 to 3 feet deep. The largest snowstorm of the winter (February 11 and 12) preceded the survey. Ship Creek usually receives larger amounts of snow than Anchorage in any given snowstorm. That did not happen in the last storm. The current snowpack did not appear to be sufficiently deep to trigger a mass migration of moose out of Ship Creek onto their traditional wintering grounds on Fort Richardson's coastal plain. A snowpack about 4 feet or more in depth is usually required to trigger such a mass migration.

2. This survey shows that moose had moved out of the headwaters area of Ship Creek and also off the subalpine slopes covered with patchy deciduous and herbaceous vegetation. Most of the remaining moose in Ship Creek were in the thickly forested areas along the creek bottoms. These areas were dominated by large patches of white and black spruce forests. The forested areas were difficult to survey. Results could be highly speculative. A more practical and accurate method for surveying moose under these conditions was to estimate the population from tracks in the snow. Improvise and do what you have to do to obtain the best results.

3. The estimated number of moose in Ship Creek on this survey from track evaluations was 96 animals. Summarized data are on the attached sheet. The numbers of moose observed in Ship Creek on the November–December 1998 and 1999 annual surveys were 173 and 197, respectively. An annual survey was not conducted in winter 2000 as the snow cover was

inadequate. The long-term average for the number of moose in Ship Creek based on the annual surveys was 109. The current migratory Ship Creek moose population has increased and would be expected to be approximately 170–180 animals. This is in early- or mid-winter prior to a deep snowpack triggering a mass migration out of Ship Creek.

4. Results of this survey show that about 50 to 60 percent of the migratory population of moose in Ship Creek is still present. The large number of moose has not migrated out of the drainage because of the small amount of snow this winter. The shallow snowpack is not sufficiently deep to trigger a mass migration out of Ship Creek. Error on this survey would not be expected to be more than 10 to 15 percent.

5. The total number of moose remaining in Ship Creek at the time of this survey is in the neighborhood of 100 animals. With an addition of 60 moose estimated to be remaining on the Chugach Mountain slopes in Survey Units 5 and 7, the Fort Richardson population of animals remaining on their late summer–fall–early winter range is 160. This large number of moose would be expected to have a significant effect on over browsing their range in Ship Creek and on the slopes. The large number of moose remaining in Ship Creek and on the mountain slopes saves their winter range on the Fort Richardson lowlands and greatly reduces the problems the animals cause when they move into the city of Anchorage.

Moose Survey in Ship Creek

(Estimated Number of Moose from Observation of Tracks)

February 24, 2001

SU 1	North Fork of Ship Creek	**# Moose**
	(No tracks, no moose)----------	0
SU 2	Headwaters of Main Stem of Ship Creek	
	(No tracks, no moose)----------	0

SU 3 East Slopes
(Tracks indicating approx. 6 moose)----------7
West Slopes
(Tracks indicating approx. 4 moose)----------4
Ship Creek Valley along stream (Forested)
(Tracks indicating approx. 24 moose)---------- 33

SU 4 East Slopes
(Tracks indicating approx. 12 moose)---------- 14
North Slopes
(Tracks indicating approx. 16 moose)---------- 16
Biathlon Bench Area
(Tracks indicating approx. 15 moose)---------- 15
South Slopes
(Tracks indicating approx. 5 moose)----------5
Ship Creek Valley along stream (Forested)
(Tracks indicating approx. 2 moose)----------2
Total---------- **96**

SU = Moose Survey Unit

MEMORANDUM 31

SUBJECT: Moose Migration out of the Ship Creek Valley

February 2, 2004

1. A large population of moose inhabits the upper Ship Creek Valley on Fort Richardson and in Chugach State Park during late spring, summer, fall, and early winter. When the snowpack reaches approximately 4 to 4½ feet in depth, usually by mid to late January, a large percentage of these moose migrate out of Ship Creek onto the Fort Richardson coastal plain near the Glenn Highway. Limited winter habitat east of the Glenn Highway causes these moose to continue to migrate to the west across the highway toward the Army and Air Force cantonment areas and off the south post of Fort Richardson into Far North Bicentennial Park. From the parklands, the moose disperse into the city of Anchorage. In the spring, when the snowpack melts away, this migratory moose population moves in an easterly direction back into the upper Ship Creek Valley.

2. The annual Fort Richardson moose survey conducted on November 15, 2003 captured the total number of migratory moose using Ship Creek in the year 2003. The total number was an estimated population of 287 moose (Table 1).

3. Additional aerial surveys were flown into Ship Creek during the winter months to determine the number of moose that remained and the number that has migrated out of the watershed. Results from an aerial survey conducted on December 25, 2003 showed that 116 moose (40%) remained in the Ship Creek drainage on this date (Table 1). A second aerial survey on January 25, 2004 showed that only 35 moose (12%) remained in the Ship Creek drainage on that date (Table 1).

4. Data from the aerial survey on December 25, 2003 showed that 171 moose (60%) have migrated out of Ship Creek by this date (Table 2). By January 25, 2004, 252 moose (88%) have migrated out of the Ship Creek drainage (Table 2).

5. In addition to Ship Creek moose moving out of the watershed, moose on the Chugach Mountain slopes adjacent to Ship Creek also migrate down onto the coastal plain on Fort Richardson. The total estimated number of moose on the western slopes of the Chugach Mountains on Fort Richardson is 81. Surveys have not been flown over the mountain slopes to validate the number of moose remaining and the number that have migrated to the coastal plain. If the percentage of moose that have migrated out of Ship Creek were used to estimate how many moose have migrated off the mountain slopes, it would be 88 percent of 81 or 71 moose by January 25, 2004. Using the estimate from the mountain slopes, the total outmigration from Ship Creek and the slopes would be 323 moose by January 25, 2004. This is a large number of moose moving out of the Chugach Mountains to the lowlands. To find adequate food sources, these moose disperse onto the military bases and to many parts of Anchorage.

6. This has been a winter with higher than average snowfall and snowpack depths. The data in this report are typical of past years for these climatic conditions. In years with low snowfall, more moose tend to remain in Ship Creek for longer periods and for most of the winter. An aerial survey in Ship Creek on February 24, 2001 showed that 50 to 60 percent of the current migratory population was still present. A larger number of moose have not migrated out of the drainage because of low snowfall and shallow snowpack this winter.

Table 1. Aerial Moose Surveys in Upper Ship Creek Valley[1]

		Estimated Number of Moose		
SU[2]	Location	Nov. 15, 2003[3]	Dec. 25, 2003[4]	Jan. 25, 2004[4]
1	North Fork	78	32	4
2	Main Stem (Headwaters)	78	7	1
3	Upper Valley (East)	49	42	11
3	Upper Valley (West)	12	4	6
4	Biathlon/Arctic Valley	43	20	8
5	Snowhawk Valley	27	11	5
	Total	**287**	**116**	**35**

[1]Data represent estimated moose populations from aerial surveys.
[2]Survey Units
[3]Data from annual Fort Richardson Moose Survey recorded by Jesse Coltrane, ADF&G
[4]Data collected from aerial surveys flown by Bill Quirk in his Arctic Tern taildragger

Table 2. Migration of Moose out of Ship Creek during the winter of 2003-2004

	Estimated Number of Moose		
	November 15, 2003	December 25, 2003	January 25, 2004
Total # of Moose remaining in Ship Creek by date	287 (100%)	116 (40%)	35 (12%)
Total # of Moose that Migrated out of Ship Creek by date	0 (0%)	171 (60%)	252 (88%)

MEMORANDUM 32

SUBJECT: FACT SHEET on Moose Management
FACT SHEET

APVR-RPW-EV
QUIRK/ 384-3010

2 February 2004

1. SUBJECT: Management of Moose on Fort Richardson, Alaska

2. BACKGROUND: Moose are the featured species for wildlife management on the Fort Richardson military installation. They are the largest, most dominant, and the most sought-after of the large mammals for hunting and for watchable wildlife. The primary source of information for moose management is based on composition data from aerial surveys conducted annually in November–December. The survey area consists of 90,000 acres and includes both military installations (Fort Richardson and Elmendorf AFB) and the Ship Creek Valley in Chugach State Park. Additional surveys are flown through the winter months to locate spatial concentrations and to determine the migratory status of moose in the upper Ship Creek Valley and on the Chugach Mountain slopes.

3. FACTS BEARING ON THE SUBJECT:

a. Over the past 18 years, the population of moose in the Fort Richardson herd has remained relatively stable at a projected population of 517 animals. The Calf:Cow ratio during this period (1986-2003) is 37 calves per 100 cows. This is somewhat higher than that of a typical moose herd in Alaska. The Bull:Cow ratio during this same time period is 50 bulls per 100 cows. This is a magnitude larger than any moose herd in Alaska because of the public's desire to maintain a greater number of bulls in the herd for urban viewing and photography.

b. The Fort Richardson moose herd is adequately productive to allow an annual hunt by permit lottery. Up to 35 muzzle-loading-rifles and 125 archery permits are issued annually. The early hunt begins the day after

Labor Day (first Monday in September) and continues through November 15. The late or winter hunt begins December 15 and continues through January 15. The annual harvest of moose during the past five years has averaged 41 animals. The hunter harvest of moose along with natural and man-caused mortality—for example, winter starvation, predation by wolves, natural injuries, highway accidents, and other mortality—account for approximately 10 to 15 percent of the herd annually.

c. The Fort Richardson moose herd consists of a resident population of animals on the forested coastal plain of the military bases and a migratory population in upper Ship Creek and on the western slopes of the Chugach Mountains. The migratory population is in their upland habitat in late spring, summer, fall, and early winter. When the snowpack in the mountains reaches a depth of approximately 4 feet, usually by late January, a mass migration of moose set out for the coastal plain on Fort Richardson. The annual moose survey is usually completed in November when the migratory moose are in their upland habitat and can be easily distinguished from the resident moose occupying the coastal plain on the military bases. In past years, the resident population was larger than the migratory population; however, in recent years (since 2000) the migratory population has grown in number while the resident population has declined, resulting in the migratory population now representing the larger population of moose in the two groups. In 2003, there was a projected population of 394 moose in the migratory population and 257 animals in the resident population for a total projected population of 651 moose in the Fort Richardson herd. The shift in numbers of migratory and resident moose is thought to be from resident moose on the military bases joining the migratory moose on their return to the mountain habitats. The shrinking of the population of resident moose on the military bases is primarily due to the degrading and declining habitat on the coastal plain.

4. ACTION TAKEN: The Army’s Environmental Resources Department at Fort Richardson and Alaska Department of Fish and Game in the Anchorage Regional Office have the responsibly for managing the Fort Richardson moose herd. Over the past 25 years, the Army has focused on habitat development and enhancement (creating new habitat areas and recycling over mature unproductive habitat), conducting annual and other

winter moose surveys, and directing the annual moose harvest in the field. Alaska Department of Fish and Game has focused on jointly completing the annual moose surveys with Fort Richardson biologists and determining the number of moose hunting permits issued for harvesting moose on the military reservations and in the upper Ship Creek Watershed.

5. ACTION REQUIRED: Continue focusing on moose habitat development and enhancement by expanding the number of acres completed each year. Work closely with civilian and military personnel to provide an awareness of cumulative impacts that projects and training have on moose habitat degradation and interference with natural movements and migration.

MEMORANDUM 33

SUBJECT: Moose Survey in the Upper Campbell Creek Drainages

November 17, 2003

1. An aerial moose survey was conducted on November 16, 2003 at 12:10 PM to document the number of moose in three Campbell Creek drainages in the Chugach Mountains 10 air miles southeast of downtown Anchorage, Alaska. The survey was flown in my Arctic Tern taildragger based at Merrill Field in Anchorage. The weather was sunny and cold. The ambient temperature was about 5 degrees Fahrenheit. There was light wind in the valleys with moderately brisk winds on the mountain slopes and ridge tops. Snow cover from the first snowfall of the year (November 8-11) was less than 6 to 8 inches. Although the mountain slopes blocked the sun, survey conditions were good especially in the subalpine habitats.

2. Three survey units (SUs) in the upper Campbell Creek watershed were surveyed (Figure 1). SU 1 was in the upper South Fork drainage of Campbell Creek. SU 2 was in the lower Middle Fork drainage of Campbell Creek. SU 3 was in three small unnamed drainages between Near Point (north) and Rusty Point (south) near the Wolverine Peak Trail. All areas surveyed were in Chugach State Park at elevations between 1,500 and 3,000 feet. Most of the areas surveyed were in subalpine habitats. A small part of the lower elevations (under 1,500 feet) was located in the boreal forest.

3. The total number of moose observed in SU 1 was 48; SU 2 was 46; and SU 3 was 26 for a total in all three SUs of 120 moose (Table 1). Flying time required to survey the three SUs was 48 minutes. An unusually large number of bull moose was observed in these populations. This would be expected from a moose population that is not hunted. Moose in these drainages will move out of the subalpine habitats when the snowpack reaches 3½ to 4 feet in depth. The moose will move downslope through the Hillside and Basher residential areas into Far North Bicentennial Park and disperse into other areas in the city of Anchorage.

4. No attempt was made to obtain composition data, for example, cows, calves, small-, medium- and large-size bulls. Large numbers of crosscountry skiers and other recreational users in the South and Middle Forks of Campbell Creek would have been disturbed by flying lower and circling each animal sighted. Low flying and circling is required for obtaining accurate composition moose data.

Table 1. Moose Observed in Upper Campbell Creek Drainages on Nov. 16, 2003

Survey Unit	# Moose Observed	Habitat(s)
1	48	Subalpine
2	46	Subalpine and Boreal Forest
3	26	Subalpine
Total	**120**	

MEMORANDUM 34

SUBJECT: Aerial Moose Survey, MacKenzie Farms, Southcentral Alaska

November 24, 2006

1. A comprehensive aerial moose survey of the MacKenzie Farms was conducted beginning at 3:02 PM on November 23, 2006. The MacKenzie Farms are located 14 miles northwest of downtown Anchorage, Alaska. The survey provides data showing the number of moose using this important wintering habitat.

2. In 1982, in a joint project by Alaska Department of Natural Resources, the Agriculture Action Council, and the Matanuska-Susitna Borough sold 14,772 acres and built the main access roads into the property. Thirty-one farms were established, 19 dairy and 12 hay farms. Approximately 12,736 acres of forests were cleared with bulldozers so the farms could be established. After five years, many of the farms became unprofitable and were abandoned. By January 2000, only 3 dairy and 4 hay farms remained operational (Steve Trickett, personal communication). Approximately 55 percent or 7,075 acres of the developed MacKenzie Farms have reverted to early successional deciduous vegetation due to lack of cultivation. The early-succession birch, cottonwood, aspen and willow saplings have become exceptional moose habitat. Moose from as far away as 30 to 40 miles migrate to the MacKenzie Farms during the winter months to take advantage of this bountiful food supply.

3. The survey was flown in my Arctic Tern taildragger based at Merrill Field in Anchorage, Alaska. Total flying time for the survey was 1 hour and 10 minutes. The weather was sunny and cold with an ambient temperature of 14 degrees Fahrenheit. Snow cover was complete; however, it was only a few inches in thickness. All the snow came in a few snowstorms about one month before (late October). The temperature since the snowstorms has been consistently low averaging in the 10s and 20s. At no time during this one-month interval has the temperature risen above freezing. Sightability

for observing moose on this survey was no better than average due to the dull snow cover (old snow) and the vegetation which was not snow covered.

4. The survey area was divided into four equally sized quadrants delineated by Guernsey Road oriented north and south and by Holstein Avenue oriented east and west. Surrounding the farming area is the mature native black spruce coniferous forest containing scattered birch and aspen trees.

5. Moose were surveyed in each quadrant and the results show that a total of 181 moose were observed at the MacKenzie farming area on November 23, 2006 (Table 1). The estimated number of moose based on a 90 percent sightability factor is 202 moose in the MacKenzie farming area. The 10 percent correction factor allows for moose bedded down and not sighted during the survey.

6. Other early winter surveys show estimated moose numbers were similar to the November 23, 2006 data (Table 2). One exception is the October 24, 2001 data, which show estimates were high (371 moose). Heavy snowstorms in early and mid October 2001 created a snowpack up to 30 inches deep. The deep snow cover triggered a large migration of moose to MacKenzie Farms. The snowpack was only a few inches deep on December 22, 2000 and December 19, 2002. The maximum number of moose wintering at MacKenzie Farms is typically found in January and February each year. Peak numbers at that time are estimated at 544 to 728 moose.

Table 1. MacKenzie Winter Moose Survey Data—November 23, 2006

Quadrant	# Moose Observed	Estimated Moose Population[1]
NW	50	56
sw	18	20
SE	68	76
NE	45	50
Total	**181**	**202**

[1]Based on a 90% sightability factor of observed moose

Table 2. MacKenzie Early Winter Moose Survey Data[1]

Quadrant	Dec. 22, 2000	Oct. 24, 2001	Dec. 19, 2002	Nov. 23, 2006
NW	54	99	69	56
SW	54	51	76	20
SE	87	160	83	76
NE	30	61	36	50
Total	**225**	**371**	**264**	**202**

[1]Data is estimated moose population based on 90% sightability factor

MEMORANDUM 35

SUBJECT: MacKenzie Aerial Moose Survey

February 22, 2001

1. A comprehensive aerial survey of the MacKenzie Farms was conducted at 10:25 AM on February 18, 2001 to record the number of wintering moose. The weather was clear with high overcast skies and a slight breeze from the north. The ambient temperature was 18 degrees Fahrenheit. Good survey conditions were found with a complete snow cover. Snow depth was approximately 2 feet. The survey was flown in my Arctic Tern taildragger based at Merrill Field in Anchorage, Alaska.

2. The results of the MacKenzie Moose Survey are shown below in Table 1.

Table 1. MacKenzie Moose Surveyed on February 18, 2001

Quadrant	# Moose Observed	Estimated Moose Population[1]
NW	218	242
sw	112	124
SE	231	256
NE	95	106
Total	**656**	**728**

[1]Based on a 90% sightability factor

3. In the northwest quadrant, moose were spatially distributed as follows: 72 moose observed in Section 35 north of Ayrshire Road; 22 moose observed northeast of the Little Susitna access road; and 124 moose observed south of Ayrshire Road. The two areas north of Ayrshire Road comprise approximately 700 acres while the acreage south of Ayrshire Road is approximately 3,800 acres.

4. The snowstorm that dumped approximately 2 to 3 feet of snow on Southcentral Alaska on February 11 and 12, 2001 was the largest of the

winter. It triggered a mass migration of moose to Mackenzie Farms. Moose observed on the December, January, and February surveys totaled 203, 313, and 656 animals, respectively. The big snowstorm resulted in more than doubling the number of moose wintering at MacKenzie in January 2001 from 313 to 656. The February survey was conducted 6 days after the snowstorm.

5. A large number of snowmachines operate on the north side of MacKenzie Farms. A parking lot for vehicles pulling trailers for snowmachines is located on the north side of Ayrshire Road east of Guernsey Road. In this parking lot were found 110 vehicles. The parking lot was full and another 52 vehicles were parked along Ayrshire Road. If the 162 parked vehicles averaged two snowmachines per vehicle, the total would be 324 snowmachines. They have a large area to operate in north to Big Lake (6 miles) and west to the Susitna River (15 miles). It is surprising that on winter surveys I have not seen any of these snowmachines running through the MacKenzie Farms. Evidently, the snowmachines are not chasing MacKenzie moose on their wintering grounds. The only disturbance to moose which has been observed on the winter surveys is from snowshoe hare hunters. Because there is not much dense cover at MacKenzie, two hare hunters can alarm and cause moose from a large area to run out of the immediate area of disturbance and relocate a half mile or more away. The extent of this low-impact disturbance is unexpected and would not be understood except from aerial observation.

MEMORANDUM 36

SUBJECT: Winter Moose Survey at MacKenzie Farms

February 7, 2008

1. A comprehensive aerial survey of the MacKenzie Farms located 14 miles northwest of downtown Anchorage was conducted beginning at 2:15 PM on February 7, 2008 to record the total number of moose utilizing this important wintering area. The survey was flown in my Arctic Tern taildragger based at Merrill Field in Anchorage, Alaska. The flying time to complete the survey was 1 hour and 25 minutes. The weather was sunny and clear. Temperature during the survey was 12 degrees Fahrenheit. Wind was from the north at 10 mph. The area had a complete cover of snow. The depth of the snowpack was approximately 2 feet. Sightability was only fair because of a bright sun.

2. The results of this survey show a total of 337 observed moose (Table 1). Based on a 90 percent sightability factor, the total number of moose estimated to be in the Mackenzie Farms is 371 moose. This is a lower number of moose at MacKenzie Farms on February 7, 2008 when compared with past years. A survey on December 31, 2004 showed an estimated number of 544 moose. A survey on February 2, 2002 showed an estimated population of 585 moose. The largest population of moose at MacKenzie was recorded on February 22, 2001 with an estimated population of 728.

3. Moose that migrate to MacKenzie are thought to come from the west and northwest from the following drainages: Little Susitna, Susitna, Yentna, and Deshka Rivers and Alexander Creek. Moose from these drainages move to MacKenzie after the rutting period and usually after several large snowstorms trigger a mass migration. By early February most of the moose that spend the winter at MacKenzie will have already migrated here. Several large snowstorms in January 2008 would have caused the moose that planned to spend the winter at MacKenzie to migrate here. Because of the previous information, this survey likely captured the maximum number of moose at MacKenzie in winter 2008.

Table 1. MacKenzie Winter Moose Survey (February 7, 2008)

Quadrant	# Moose Observed	Estimated Moose Population[1]
NW	87	96
sw	68	75
SE	114	125
NE	68	75
Total	**337**	**371**

[1]Based on a 90 percent sightability factor

MEMORANDUM 37

SUBJECT: Winter Moose Survey, Big Lake, Alaska

February 17, 2011

1. An aerial survey was conducted on the north and east sides of Big Lake on February 17, 2011 at 2:35 PM to determine the number of moose wintering in the area that burned in the Miller Reach fire in 1996. The survey was flown in my Arctic Tern taildragger based at Merrill Field in Anchorage, Alaska. The day was partly sunny with a high overcast. The ambient temperature was 15 degrees Fahrenheit with a light wind blowing from the northeast. The snowpack was 1 to 2 feet in depth. Survey conditions for observing moose were average. The flying time for the survey was 1.6 hours.

2. Surveying the burned area is easily accomplished as the trees that burned in the fire are charred and many are still standing. The charred trees are blackened and are easily distinguished from living trees from the air. The 1996 fire burned 32,000 acres and was sufficiently hot in many areas to destroy part or all of the organic and duff layers which lie on top of the soil surface. This resulted in exposing mineral soil. Hardwood seed naturally broadcast by the wind fell on the mineral soil and germinated. It has been 15 years since the burn and the early succession hardwoods, for example, willows, birch, and aspen are flourishing and producing excellent winter moose habitat.

3. The survey area was divided into three parts as follows: (1) North and northeast of Big Lake to the Little Susitna River, the Parks Highway, and the Big Lake Road comprising 14,720 acres; (2) Lucille Creek drainage from Big Lake Road south to Hollywood Drive comprising 7,040 acres; and (3) East of Big Lake and south of Hollywood Drive comprising 10,240 acres. The three parts totaled 32,000 acres or 50 square mile Sections.

4. The results show that 218 moose were observed in the northeast part; 90 moose were observed in the Lucille Creek part; and 155 moose were observed in the east part. A total of 463 moose were observed in the three

areas (Table 1). Sightability during the survey was average. With 85 percent sightability on the survey, the total estimated population of moose in the burned areas near Big Lake would be 533 moose. This is a new high total number of moose when compared to previous years.

Table 1. Moose Survey Data, Big Lake, Alaska (February 17, 2011)

Survey Areas	Observed Moose	Estimated Moose[1]
Northeast of Big Lake	218	251
Lucille Creek Drainage	90	104
East of Big Lake	155	178
Total Number of Moose	**463**	**533**

[1]Using sightability factor of 85%

5. Results on a survey conducted on February 8, 2008 showed an estimated total of 471 moose (Table 2). The wintering moose numbers in the Big Lake burned area are up substantially from past years. The estimated population of moose in the Big Lake burned area in February 2001 was 322. The following year, in 2002, showed an estimated population of 393.

Table 2. Moose Survey Data, Big Lake, Alaska (February 8, 2008)

Survey Area	Observed Moose	Estimated Moose*
Northeast of Big Lake	184	239
Lucille Creek Drainage	130	169
East of Big Lake	48	63
Total Number of Moose	**362**	**471**

*Using sightability factor of 70%

6. It is worthwhile to know how many resident and how many migratory moose use this burned area near Big Lake. Additional surveys in late winter after most of the moose have moved to their traditional summering grounds and surveys in early winter before the migrating moose have returned will be necessary to answer the question. The surveys in the summer, without snow cover, are almost useless as the sightability would be expected to be too low to be of any value. Surveys at MacKenzie Farms after the first snowfall in October and surveys late in the winter have shown few moose recorded. This indicates that MacKenzie has high moose numbers during the winter. It is an important moose wintering area that is almost totally abandoned in summer.

MEMORANDUM 38

SUBJECT: Winter Moose Survey at Big Lake

February 26, 2013

1. An aerial survey was conducted on the north and east sides of Big Lake (24 miles north of Anchorage) on February 25, 2013 beginning at 3:30 PM to determine the number of moose wintering in the area that burned in the Miller Reach fire in 1996. The survey was flown in my Arctic Tern taildragger based at Merrill Field in Anchorage, Alaska. The skies had a thin overcast. The ambient temperature was 30 degrees Fahrenheit with northeast winds blowing 10 to 15 miles per hour. The snowpack was 1 to 2 feet in depth. Survey conditions for observing moose were average. The flying time needed to complete the survey was 1.9 hours.

2. The survey area was divided into three segments as follows: (1) North and northeast of Big Lake to the Little Susitna River, the Parks Highway and the Big Lake Road totaling 14,720 acres (23 Sections); (2) Lucille Creek drainage from Big Lake Road south to Hollywood Drive comprising 7,040 acres (11 Sections); and (3) East and southeast of Big Lake and south of Hollywood Drive comprising 10,240 acres (16 Sections). These three segments total 32,000 acres or 50 square mile Sections.

3. Survey results in February 25, 2013, with a grand total of 956 estimated moose, show an all-time high for wintering moose at Big Lake (Table 1). The number of moose wintering at Big Lake has increased substantially (almost doubled) from the numbers found here 10 year ago. The number of moose at Big Lake in 2013 has increased by 80 percent over the estimated number of moose on February 17, 2011 (Table 1). Increases in the number of moose in 2013 were found in all three survey areas; however, the greatest increase was in the area north and northeast of Big Lake where the increase was 106 percent. The moose numbers increased in the Lucille Creek part by 60 percent and in the east and southeast part of Big Lake by 53 percent. Other surveys in the Big Lake burned area in previous years showed 330 moose in February 23, 2002; 545 moose in November 7, 2003; 471 moose in February 8, 2008; and 533 in February 17, 2011.

4. The landform of the burned area near Big Lake consists of repeating long and narrow swales (up to a mile in length) parallel to long and narrow gently sloping uplands (plateaus) which rise in elevation north and northeast of Big Lake from 10 to 50 feet and rising from 50 to 200 feet east and southeast of Big Lake. The swales are depressions supporting the growth of wetland vegetation. The less wet or moist areas in the swales may provide suitable conditions for the growth of hardwood vegetation. The soils on the ridges are well-drained and support the growth of hardwood saplings consisting of birch, aspen, cottonwood, and willow. These plateaus support the high value moose winter habitat in the Big Lake area. The hardwood species have been flourishing and their biomass has increased several folds over the years since the fire in 1996. The large numbers of moose that come here in this emerging winter habitat are thought to be moose that formerly wintered in the riparian habitat in the much-braided Susitna River drainage. Evidently, the quality and quantity of the moose habitat in the Big Lake area is better than the riparian habitats in the Susitna River. Moose will switch winter habitat areas when they find one that is more productive than the one that they currently use.

5. Additional surveys are needed to determine the number of moose that remain in the Big Lake area year-round. Also needed is information on moose migration corridors. It is likely that a large number of moose that winters at Big Lake moves out of the area when the snow melts in April. These moose migrate to their summer, fall, and early winter habitat. Migrating moose wintering at Big Lake likely come from the northwest and north (Susitna River) and from the northeast (western mountain slopes of the Talkeetna Mountains).

Table 1. Moose Survey Data, Big Lake, Alaska

Survey Areas	Observed Moose		Estimated Moose[1]	
	Feb. 17, 2011	Feb. 25, 2013	Feb. 17, 2011	Feb. 25, 2013
Northeast of Big Lake	218	450	251	518
Lucille Creek Drainage	90	145	104	167
East of Big Lake	155	236	178	271
Total Moose	**463**	**831**	**533**	**956**

[1]Using Correction Factor of 15%

MEMORANDUM 39

SUBJECT: Winter Moose Survey for Alexander Creek

February 28, 2000

1. A comprehensive survey of the riparian area of Alexander Creek was conducted at 3:30 PM on February 26, 2000 to record the total number and distribution of moose using this important wintering area. Alexander Creek is a small drainage that flows into the lower Susitna River below Susitna Station. The creek begins at Alexander Lake which is approximately 50 air miles northwest from downtown Anchorage. The survey was flown in my Arctic Tern taildragger based at Merrill Field in Anchorage. Total flying time for the survey was 40 minutes. The sky was overcast and there was a gentle breeze. The ambient temperature was 26 degrees Fahrenheit. The depth of the snowpack was 1 to 2 feet and was continuous. Sightability for locating moose was excellent.

2. The survey results show that 63 moose were observed in upper Alexander Creek drainage from Alexander Lake to Wolverine and Sucker Creeks and 125 moose in lower Alexander Creek, which empties into the lower Susitna River. The total number of animals observed for the entire creek was 188 moose. The estimated or projected population was conservatively calculated to be 207 moose for the entire Alexander Creek drainage. This was based on a sightability factor of 90 percent. Moose bedded in adjacent forests that were not observed would easily account for this discrepancy.

3. The total number of moose found in this drainage was surprisingly high, as the riparian area of Alexander Creek is very narrow. A heavily used snowmachine and dog mushing trail goes right up the creek from the Susitna River to Alexander Lake. Moose are bedded near the trail, as they do not find it feasible to climb the bluff away from the creek to get away from snowmachine traffic. There are numerous cabins and lodges on the lower 5 miles of the creek. The moose using this drainage notwithstanding the human intrusion have learned to adjust to the heavily used motorized trail and appear to be wintering fairly well.

MEMORANDUM 40

SUBJECT: Early Winter Moose Survey in the Palmer Hay Flats

November 6, 2001

1. An aerial survey was conducted at 3:25 PM on November 3, 2001 in the Palmer Hay Flats and vicinity (lower Matanuska and Knik River drainages) to record the total number and distribution of moose using this important wintering area. The survey was flown in my Arctic Tern taildragger based at Merrill Field in Anchorage. Total flying time was 1 hour and 10 minutes. The sky was overcast, the winds were light and variable from the south, and the temperature was 26 degrees Fahrenheit. The snowpack was continuous with a depth of approximately 12 to 15 inches. Overall sightability for locating moose was good.

2. The results of the November 3, 2001 survey showed that a total of 74 moose were observed in the Palmer Hay Flats and adjacent areas (Table 1). The greater number of moose observed on this survey were most likely resident moose. Census data show that the snowstorms in October 2001 were not sufficient to trigger a mass migration of moose to these wintering grounds. The area with the largest number of moose observed on this survey was in moderately good quality winter habitat southwest of Palmer and east of the Glenn Highway along the west side of the lower Matanuska River floodplain.

Table 1. Moose Observed in the Palmer Hay Flats and Vicinity[1]

Survey Area	**Moose Observed** Feb 21, 2000	**Moose Observed** Nov 3. 2001
Lower Knik River Drainage	20	4
Lower Matanuska River Drainage	15	12
	61	42

Palmer Hay Hats (E of Glenn Hwy)		
Palmer Hay Hats (W of Glenn Hwy)	179	16
Totals	**275**	**74**

[1]Includes the lower Knik and Matanuska River drainages

3. Most of the migratory moose that utilize the Palmer Hay Flats and vicinity concentrate in the area west of the Glenn Highway. The February 21, 2000 survey showed 179 moose in the Palmer Hay Flats west of the Glenn Highway compared to only 16 on this survey (Table 1). The November 3, 2001 survey data represent only 10 percent of the February 21, 2000 numbers. This shows that significant numbers of moose have not migrated to the Palmer Hay Flats after the snowstorms in October 2001. The data for the wintering grounds on the Palmer Hay Flats and vicinity contrasts sharply with the data from the Mackenzie Farms. A survey at MacKenzie showed that 334 moose were observed on October 24, 2001. This represents about half of the total migratory moose that would be expected to utilize MacKenzie at peak times in winter.

4. The Palmer Hay Flats and vicinity represent critical escape habitat for wintering moose which migrate out of their local area when a deep snowpack covers up the food supply and the expenditure of energy moving through the deep snowpack becomes prohibitive. In years with shallow snow accumulation when the snowpack does not build up to high levels greater than 4 feet, few moose would be expected to migrate to the Palmer Hay Flats.

5. The Palmer Hay Flats with their poorer quality and meager quantity of habitat draws migrating moose when the snowpack reaches intolerable levels in the local area. The attraction of the Palmer Hay Flats for moose is the snowpack depth, which remains shallow throughout the winter and rarely builds up to great depths because of lower annual snowfall and frequent Chinook winds from the Knik River Valley that sublimates the snow.

6. The wintering habitat at MacKenzie is strikingly different from the Palmer Hay Flats and vicinity in that it draws a large number of animals early in the winter when snow depths are not sufficiently deep to trigger mass migrations of animals. The reason for the difference in these two wintering areas is that MacKenzie, unlike the Palmer Hay Flats, has prime winter habitat composed of high biomass feltleaf and Scouler willow along with birch saplings growing in productive soils. Moose arrive early at MacKenzie because the habitat available is superior to what they would have if they remained in their local area. MacKenzie is an important winter habitat area that attracts large numbers of moose throughout the winter. The Palmer Hay Flats attract moose escaping the deep snowpack whenever that occurs.

MEMORANDUM 41

SUBJECT: Wildlife Paper on Urban Moose in Anchorage, Alaska

An Urban Wildlife Classic in Anchorage, Alaska

William A. Quirk, lll[1]

July 20, 1999

An urban wildlife classic consisting of a high-density moose population in a heavily used recreational area was observed in the winter of 1999 near Service High School in the southeastern part of Anchorage, Alaska. To obtain a better understanding of how moose use the area, aerial surveys of the animals were conducted in midwinter (January and February) and a field reconnaissance of the vegetation and soils were completed in April and June. While this wildlife classic is happening here, it is thought to be repeated often in other urban areas in Anchorage. This phenomenon has not been previously reported. The purpose of this paper is to provide insight into how moose utilize winter habitat and intermingle with humans in an urban environment. This is important in learning how to effectively manage the large number of urban moose inhabiting the Anchorage Bowl.

The area of interest is a previously burned forest consisting of approximately 80 acres in size located east of Service High School (Figure 1). The area is intercepted by numerous trails which were constructed prior to the burn to provide a training area for the Service High School cross-country ski team. The trails in the burned area have been expanded over the years and they have become popular and heavily used not only by student athletes but also by Anchorage residents for skiing in winter and hiking in summer. A trailhead and large parking area was constructed for public access to the trail system which lies within Far North Bicentennial Park.

This urban wildlife classic shows the compatibility of wildlife completely integrated into a high-use recreational area without apparent deleterious results to either the moose or to the recreational skiers. The fire removed the forest and allowed the willows and other hardwood shrubs to flourish,

creating excellent winter moose habitat. Pockets of high-value habitat are usually discovered by moose. This burned area was no exception. In a highuse recreational area, moose would normally feed when trail users are not present and bed down in adjacent spruce forest when recreational users return. Avoiding recreational users may have been the strategy early on; however, the moose have learned to adapt to the regular patterns of trail users. Trail users have a consistent pattern of moving through the area on the trails. Rarely do they get off the trail system and penetrate into moose habitat areas. Moose have learned over time that trail users pose no real threat to them. Trail users see moose on occasion when one gets up from its bed and feeds nearby or walks on the trails. However, recreational users have infrequently reported encounters or problems with moose in the area or on the trails. It is obvious that moose using the burn area are not harassed by trail users. This is unlike other areas in Anchorage where moose are continually being harassed by barking dogs, moving vehicles on streets and roads, and children throwing snowballs.

Four intensive aerial surveys were conducted to determine the number and spatial orientation of moose using the previously burned area. The aerial surveys were flown in my Arctic Tern taildragger. Flying time was approximately 8 minutes for each survey. The number of moose observed in the burned area on the first survey on January 8, 1999 was 18. Additional surveys on February 22, 26, and 28 found 15 moose on each survey. All surveys were flown between 1 and 2 PM. The number of moose observed in the burned area represents a very high density of moose using a limited winter habitat area. Most of the moose observed were bedded down in the burned area farthest from the ski trails. A few moose observed were bedded down close to the trails. Only 1 to 3 moose were observed bedded down, on each survey, in the adjacent forest surrounding the burned area. Numerous skiers were observed on all survey days using the trails in the burned area.

The field surveys were completed to determine habitat composition and browse production and utilization. These tasks were determined by ocular estimation (eyeballing) from representative areas within the burned area. The vegetation in the burned area was accessed along the trails on crosscountry skis in early April. The soils and the amount of moose pellets

in the burned area were evaluated in June to obtain a better understanding of the productivity of the site.

The vegetation in the burned area represents outstanding moose habitat consisting of a dense mixture of Scouler willow, aspen, and birch saplings growing on a highly productive site. The early succession vegetation came back after a fire in the 1980s removed a mature black spruce forest. The native forest also contained mature aspen groves and a few widely scattered mature paper birch trees. Willow was in the understory on the forest floor; however, it did not provide high-value moose habitat as woody shrubs cannot flourish in a closed-canopy spruce forest. The vegetation currently growing in the burned area is on a gently sloping terrace with a northwest aspect between 400 and 500 feet above sea level. Aspen and paper birch saplings from 4 to 10 feet in height dominate the woody plants in the burned area. Scouler willow grows in widely scattered clumps. The density of the deciduous saplings that came back after the burn is exceedingly high due to the exposure and warming of the surface or mineral soil, the release of nutrients from the burned trees, the lack of graminoids (grasses) and the relatively deep loamy soils that create a mesic site for vegetative growth. Aspen saplings grow in almost pure stands in the wetter sites found in depressions and swales. Paper birch saplings dominate and are very dense on drier slopes and ridge tops. Scouler willow clumps can be found growing in most areas with the exception of the wettest and driest sites. A small percentage of the woody saplings (primarily paper birch) have escaped heavy browsing and are 15 to 20 feet in height. Small spruce trees from 4 to 10 feet in height are growing back at moderately high densities. A second generation of spruce seedlings, 2 to 3 feet in height, is present in the understory. The spruce in the burned area is primarily black spruce; however, white spruce was found growing on some of the better-drained sites.

Browsing intensity and utilization in the burned area were evaluated in April and were found to be extremely high. The available stems on the willow and aspen saplings were being browsed at 95 percent and higher on almost all plants. The paper birch saplings were being browsed at a much lower rate of 40 to 70%. Birch stems in this area were not nearly as preferred as were willow and aspen. Approximately 40 percent of the

escaped paper birch saplings were ridden down and broken in half by moose so that they could be browsed on the terminal branches. Breaking down of such a high percentage of escaped birch saplings indicate a shortage of winter food supply. The severely browsed willow and aspen saplings in the burned area also showed a shortage of winter food supply and the need for development of additional moose habitat in adjacent areas.

The June field survey showed that some of the pure stands of aspen saplings were experiencing high mortality with many stems lacking in chlorophyll and leaves. Most of the Scouler willow was severely browsed in winter, however, no plants could be found that were experiencing mortality. Some of the birch saplings also showed severe browsing, but like Scouler willow, they did not show signs of mortality. The field survey clearly shows that birch and especially willow can withstand repeated over browsing for many years and still continue to produce stems and leaves during the growing season to sustain life. However, with such intense browsing, the biomass of willow and birch would be quite low and would not provide an adequate food source for the large number and high density of wintering moose using the burned area.

The burned area was a highly productive site for vegetative growth because of the unusually deep and loamy textured surface soils. Unlike most of the forest soils in lowland areas around Anchorage that are very shallow and have a high content of glacial deposited parent materials (coarse sands, gravel, cobbles, and stones), the burned area escaped the Pleistocene glaciers and had more time to develop the deeper, more productive surface soils. The organic horizon in the burned area was destroyed in the fire and sufficient time had not been available for it to be replenished. The soil in the A Horizon was about 2 to 3 inches in thickness and is a dark brown fine silty loam. The B Horizon consisted of about 8 to 12 inches of light reddish brown loam which gradually grades into the C Horizon of courser textured loam. A limited amount of gravel-sized material was found just below the A Horizon and a few cobbles were found in the B and C Horizons.

The soils in the burned area were surprisingly free of coarse stone materials and therefore are able to retain a large quantity of moisture for plant uptake and growth. The number of moose pellets on the ground was very high. The

pellets are broken down by weathering agents and biological processes and are incorporated into the soil, providing primary fertilizer nutrients for plant growth. The burned area would be considered a mesic site where plants have sufficient quantities of moisture and nutrients to provide a lush growth.

This wildlife classic shows that under certain conditions large ungulates such as moose are compatible with high-use recreational areas. The urban moose found in Anchorage have over time learned how to coexist with humans in residential and high-use recreational areas that provide suitable habitat. Wildlife biologists, land managers, planners, and others have had little or nothing to do with making this possible. The moose have determined how to live with people in an urban setting to a very high degree. In the burned area, it is working very well and changes to reduce or eliminate use by moose are not needed. Where moose and human interaction are causing problems, for example, ski trails in Kincaid Park, the development of habitat in adjacent areas could be accomplished to attract and keep moose away from the trails and other problem areas. Enhancement of over mature and decadent moose habitat and the development of new habitat are well documented and have been successfully demonstrated for the past 25 years (since 1974) on the Fort Richardson military reservation adjacent to Anchorage. The same techniques used there could be applied in the Anchorage Bowl with an assured success.

The winter moose population in the Anchorage Bowl is estimated at 800 to 1,000 by Alaska Department of Fish and Game (in the management plan, “Living with Wildlife in Anchorage”). With such a large population of moose in the city, the wildlife classic east of Service High School most likely repeats itself many times over in other parts of Anchorage. It is not obvious and well known because aerial surveys in the city that could reveal shared high density moose concentrations with high human use areas have never been flown.

Jan Buron, the Service High School cross-country ski coach, said that there are more moose this winter near the ski trails than observed in past winters but that there have not been any problems. The coach said trail users with

poor skiing skills, such as small children, would be most vulnerable to getting out of the way of moose that may be on the trails. From all indications, it appears that the bedded moose are well adjusted to the skiers and that the skiers and the moose are compatible in this area.

The information in this paper can be useful in helping to formulate the moose management section in Alaska Department of Fish and Game's wildlife plan "Living with Wildlife in Anchorage." Great strides could be made with the preparation and implementation of a moose management plan that focuses on clear tasks to be performed in the proper sequence. Below is a straight forward and step-wise listing of tasks to facilitate the development of a Moose Management Plan for the Anchorage Bowl.

(1) Conduct Annual Moose Surveys
- Aerial surveys in November and December
- 100 percent coverage of moose habitat areas in the Anchorage Bowl
- Data collected for determining composition, total population numbers, and spatial location of high density moose concentrations
- Annual report

(2) Conduct Random Moose Surveys
- Aerial surveys throughout the year to accomplish specific objectives
- Aerial searches to locate high density moose concentration areas
- Aerial reconnaissance to obtain spatial orientation of important habitat areas in the Anchorage Bowl
- Report for each survey or reconnaissance flight
- Overlay of high density moose habitat areas on vegetation base map

(3) Develop a Moose Habitat Map for the Anchorage Bowl
- Use vegetation base map to delineate and classify habitat areas.
- Determine vegetation composition of moose habitat areas.
- Determine vegetation age class, condition, and biological productivity of habitat areas.
- Determine nutritional quality of habitat for moose utilization.
- Prepare moose habitat map for the Anchorage Bowl.

(4) Determine Land Status of Moose Habitat Areas
- Overlay moose habitat areas to show land status (ownership).

Prepare final map.

(5) Determine Moose Movement Patterns and Migration Corridors
Attach satellite transmitters on moose.
Conduct a multiyear study to monitor daily movements, migration routes, and patterns.
Prepare final report.

(6) Initiate Moose Habitat Enhancement and Development Projects
Review moose habitat areas and land status map to determine appropriate areas for habitat improvement projects.
Reduce moose/human conflicts in the Anchorage Bowl by developing habitat enhancement projects similar to Fort Richardson.
Prepare action plan for moose habitat improvement projects.

(7) Revise/Redevelop the Moose Management Plan for the Anchorage Bowl
Utilize the data and knowledge collected in the previous six tasks.
Prepare revised plan.

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MEMORANDUM 42

SUBJECT: Modus Operandi for Flying Wildlife Surveys in Alaska

September 25, 2012

1. The traditional way of flying wildlife surveys in Alaska is with a pilot flying the airplane and a biologist recording the survey data. A nontraditional way of flying wildlife surveys in Alaska is with a pilot–biologist flying the airplane and recording the survey data—a oneperson operation.

2. The Super Cub is the traditional aircraft used to conduct wildlife surveys in Alaska. Other two-place aircraft are used; however, they are used less often than Super Cubs. Larger and heavier aircraft are occasionally used for flying wildlife surveys in Alaska. These are four-place aircraft and frequently include the following Cessnas: C180 and C185 taildraggers and C182 tricycle gear aircraft. Helicopters are seldom used for flying wildlife surveys in Alaska because of noise and prohibitive operational costs.

3. The Super Cub taildraggers or equivalent airplanes are best suited for wildlife surveys in Alaska because of the low flying speeds, low noise emissions, low cost of flight operation and maintenance, tighter turning operations, and safer off-airport landings in case of emergencies. The larger and heavier Cessna four-place aircraft are much less suitable for wildlife surveys in Alaska because of the high noise emissions which disturb wildlife much more than the Cub, because of the higher flying speeds which result in lower sightability of wildlife, the difficulty and safety of making tight circles around moose for accurate surveys, the higher costs for operation and maintenance of the aircraft, and the difficulty of finding suitable landing places in remote areas in case of emergencies.

4. Flying wildlife surveys in Alaska as a pilot–biologist—a one-person operation—has several advantages over a traditional two-person operation (pilot and biologist). First and foremost, flying the airplane is much safer with lighter overall weight of the aircraft. The cost savings of a one person

operation compared to a two-place team is considerable. The third advantage of the pilot–biologist survey operation is that it requires no coordination with a second person. This is paramount in reducing complicated scheduling of surveys with another person. Combined with adverse weather conditions, scheduling surveys with another person can become a difficult and frustrating task. The flexibility of the one-person operation provides a tremendous advantage over the two-person team.

5. In having been involved in both the one-person and the two-person operation for flying wildlife surveys in Alaska, I would opt for the oneperson (pilot–biologist) as being the better way to manage this type of flying requirement. Some say it is unsafe for a pilot to fly and survey wildlife at the same time. In 25 years of flying wildlife surveys in Alaska in a one-person operation, I've never, not once, found this to be a problem. I like the solitude and time for contemplation while flying wildlife surveys in Alaska. This provides an environment better suited for concentration on the task at hand and stress-free flying of the aircraft. Flying surveys whenever the pilot chooses to fly without consultation with a second person is a tremendous relief in reducing the complexity and difficulty of the task. The wildlife survey by a one-person operation would provide a better overall survey because the pilot–biologist will have a clearer focus and concentration on the task and would have no interference or distraction from a second source. The accuracy of the survey and the finding of the highest number of wildlife have a lot to do with placement of the aircraft in the proper position for locating the wildlife targets. It is much easier and more accurate to position the airplane for pilot observation versus attempting to position it for the person in the backseat of the aircraft. For all the above reasons, the one-person operation for conducting wildlife surveys will prove, in the long term, to be the best by a large margin.

MEMORANDUM 43

SUBJECT: Brown Bear Survey in Trading and Redoubt Bays

July 10, 2000

1. I conducted a comprehensive aerial survey in Trading and Redoubt Bays on the northwestern side of upper Cook Inlet at 2 PM on Saturday, July 1, 2000 to record the number and distribution of brown bears in the coastal wetland habitat. I flew the survey in my Arctic Tern taildragger. The sky was slightly overcast with sunny intervals. The ambient temperature was 65 degrees Fahrenheit.

2. The survey was flown between 350 and 500 feet above ground level sufficiently high so as to not disturb bears. The survey was flown in a continuous coverage pattern from Nikolai Creek on upper Trading Bay southwest along the coastal marshes to Cannery Creek on lower Redoubt Bay. All bear observations were within 1 to 1½ miles of salt water.

3. The bear observations were recorded on U.S. Geological Survey maps on the scale of 1 inch to the mile (Figures 1 and 2). The symbols on the maps are summarized and explained in Enclosure 1. The survey results conducted on July 1, 2000 showed the total number of brown bears observed in the coastal wetlands in Trading and Redoubt Bays was 46 (Tables 1 and 2). Trading Bay showed 15 bears and Redoubt Bay 31. Composition of the bears for the two bays is shown below in Tables 1 and 2. The criteria used to determine bear composition are described in Enclosure 2.

4. The spatial distribution of bears in the coastal wetlands on the western side of upper Cook Inlet shows that predominantly sows with cubs are using the coastal habitat in Trading Bay (Table 1). All bears observed in Trading Bay were sows with cubs with the exception of one adult found south of the McArthur River. The sows may be selecting marginal habitat along the Trading Bay coast to avoid encounters with adult male bears that could be lethal to the cubs. Brown bears in the coastal wetlands of Redoubt Bay show a more uniform composition and double the number of bears using the Trading Bay habitat (Table 2). Thirty one (31) bears were

observed in Redoubt Bay while 15 were observed in Trading Bay. Redoubt Bay appears to be the choice and most preferred coastal habitat of the two bays.

5. I surveyed the Redoubt Bay coastal wetlands for brown bears in early July 1989. The aerial survey consisting of a narrative with a map showed the location and numbers of bears found (Enclosure 3). The numbers and the locations of the bears in the coastal wetlands in the 2000 survey appear to be similar to the 1989 survey data results. The bears apparently come down along the coast annually in mid to late June for a few weeks to feed on sedges prior to feasting on salmon later in the summer.

6. This survey was conducted near mid day on a warm sunny afternoon. I wondered how many bears had temporarily departed the coastal wetlands at midday for the inland brushy areas to seek cover and escape the heat. The survey, therefore, is a snapshot in time and may grossly under estimate the true numbers of bears using the coastal marshes in Trading and Redoubt Bays. Multiple surveys on the same day and throughout the bears' use of the coastal habitat are needed to obtain accurate data for determining bear density and the total number of bears in this coastal habitat. One conclusion that should be drawn from this survey is that there are a sufficiently large number of bears using this habitat to establish it as a 'keystone habitat' for the brown bears of Trading and Redoubt Bays. Active management to protect the habitat and the bears while they are present should be a goal of the land manager.

7. Inventorying brown bears in most habitats is difficult or impractical because brush and forest cover prevent detection of sufficient numbers of bears to provide accurate data. The coastal wetlands of Trading and Redoubt Bays provide an exceptional opportunity to gather composition data on a large number of bears in mid summer due to excellent survey conditions without brush and other concealing cover. Surveys under these conditions result in observation of a large percentage of the bears present during the survey. The aerial surveys can be very efficient and conducted in about 1½ hour's flying time. The surveys could provide the most comprehensive data for the brown bears inhabiting these areas and could

possibly provide reliable trend data representative of the entire brown bear population between the coastal areas and the mountains.

8. One concern I observed while flying the survey was the proliferation of cabins in the coastal areas in both bays where the bears are feeding. Newly constructed cabins can be seen each year. This year was no exception. The cabins are mostly recreational cabins (duck and goose hunting); however, some cabins are utilized by commercial fishermen in the summer months. There was a float plane in a small lake near a recreational cabin near the mouth of McArthur River (Figure 1). Although this area contained a very large number and high density of bear trails through the grasses and sedges, not one bear was observed within a 2 mile radius around the human occupation. The survey also shows that bears seem to be avoiding high quality habitat along the lower stretches of the major rivers, for example, McArthur River in Trading Bay and Big River in Redoubt Bay. There were no bear trails or bears in these areas. To a lesser extent, this also applies to the coastal areas along the lower Kustatan and Drift Rivers in Redoubt Bay. The commercial fishermen occupy cabins on the large rivers and the constant traveling by boats from the cabins to the fishing grounds in Cook Inlet potentially creates sufficient disturbance to displace the bears from these important summer habitat areas.

9. Another concern is the amount of aviation traffic that overflies the Trading and Redoubt Bays during the summer months. During the survey I saw one large single-engine, float-equipped aircraft flying south at approximately 150 feet AGL over the coastal wetlands 2 air miles northeast of the Big River. One adult bear underneath the plane’s flight path became highly annoyed and started running, then stopping, and turning in small circles to search for the source of disturbance. After the survey was completed, the author landed on a gravel strip near Nikolai Creek for a 15-minute break. Perhaps a dozen aircraft passed over, the lowest flew at about 1,000 feet AGL. For the most part, air traffic was not causing disturbance problems for the bears. The questions that need to be answered are how much disturbance is acceptable? How much should be tolerated for the well-being of the bears?

10. The greater part of the coastal wetlands in Trading Bay is included in the Trading Bay State Game Refuge. The most productive and largest extent of the coastal wetlands of Redoubt Bay from the Kustatan River to Drift River is included in the Redoubt Bay State Critical Habitat Area. The Seward Sectional Aviation Chart shows coastal wetlands and mudflats that are included in the Trading Bay and Redoubt Bay Sanctuaries (Figure 5). Pilots are requested to avoid flight in these sanctuaries below 1000 feet AGL during waterfowl migration periods in the spring and fall. Although there are some guidelines and restrictions for migratory waterfowl in the coastal areas of these two bays, there don't appear to be any for the bears.

11. Perhaps with sufficient data on where the bears are concentrated and the timing of their use of the coastal wetlands of Trading and Redoubt Bays, education could be provided to cabin users, commercial fishermen, and airplane pilots to ensure the bears are not harassed or displaced from their important summer habitat. Information and recommendations about human presence in the coastal habitat when the bears are present could be added to the Trading Bay State Game Refuge and the Redoubt Bay State Critical Habitat Area brochures. Information and recommendations could also be added to the Seward Sectional Aviation Chart for the existing sanctuary areas which are along the coast near salt water. The revised brochures and aviation charts with added bear information could be the beginning of an important public awareness effort to benefit the bears when they are concentrated near the coast of Trading and Redoubt Bays in early to mid summer.

Symbols used on Maps to denote Brown Bear Composition

Single or Lone Bears:

A Adult Bear
A (Y) Young or Subadult Bear

Sow with Cubs of the Year:

Sow + 1 (C)
Sow + 2 (C)
Sow + 3 (C)

Sow with Yearling Cubs:

Sow + 1 (YR)
Sow + 2 (YR)
Sow + 3 (YR)
Enclosure 1

Physical Characteristics used to distinguish between Adult, Subadult, Sow with Cubs and Cub Brown Bears[1]

Adults

- Large Body Size
- Large Body Length
- Large Head
- Small Ears

Subadults

- Smaller Body Size
- Short in Length
- Small Head
- Large ears
- Fluffy Fur

Sows with Cubs

- Obvious

Cubs of the Year

- With Sow
- Small Size

Yearling Cubs

- With Sow
- Larger Size
- Fluffy Fur

[1]There was no attempt to distinguish between male and female Adult or Subadult bears on this survey

Enclosure 2

Table 1. Brown Bears observed in the Trading Bay Coastal Wetlands[1]
July 1, 2000

Bear Composition	Number(s)
Sow + 2 (C)	3
Sow + 3 (C)	4
Sow + 3 (C)	4
Sow + 2 (YR)	3
Adult	1
Total Bears	**15**

[1] The bear observations listed above are in sequential order in which the survey was flown from Nikolai Creek southwest to the McArthur Flats

Composition Summary of Bears at Trading Bay

Bear Composition	Number(s)
Adults	1
Sows with Cubs	4
Cubs (C)	8
Cubs (YR)	2
Total Bears	**15**

Table 2. Brown Bears observed in the Redoubt Bay Coastal Wetlands[1]
July 1, 2000

Bear Composition	Number(s)
Sow + 3 (YR)	4
Sow + 3 (YR)	4
Adult	1

Young Adult	1
Young Adults (Siblings)	2
Adult	1
Adult	1
Sow + 2 (YR)	3
Sow + 2 (C)	3
Adult	1
Subadult	1
Subadult	1
Subadult	1
Sow + 1 (YR)	2
Adult	1
Adult	1
Adult	1
Adult	1
Adult	1
Total Bears	**31**

[1] The bear observations listed above are in sequential order in which the survey was flown from the Kustatan River southwest to Cannery Creek

Composition Summary of Bears at Redoubt Bay

Bear Composition	**Number (s)**
Adults	9
Subadults	6
Sows with Cubs	5
Cubs (C)	2

Cubs (YR)	9
Total Bears	**31**

MEMORANDUM 44

SUBJECT: Wildlife Paper on Brown Bears in Ship Creek

The Brown Bears of Ship Creek, Southcentral Alaska

William A. Quirk, lll[1]

December 12, 2002

The Bears of Ship Creek. Numerous bear survey reports in upper Ship Creek from the 1980s to the present have been written by the author to document the findings. Most of the bear observations that were documented were those of brown bears, as the Ship Creek Watershed is excellent brown bear habitat and relatively high densities of brown bears live here. The brown bears would tend to discourage black bears from using the area and limit their density in the Ship Creek drainage. Another reason for the low number of black bear observations is the difficulty of observing them from the air in their forested habitat. Brown bears are found in forest habitat; however, they spend more time in subalpine habitats than black bears and therefore are more readily observed. The few black bears that were seen over the years were observed predominantly in subalpine vegetation zones where sightings are greatly facilitated. Most black bear observations over the years were made as incidental sightings as the main goal of the surveys was to document the brown bears in Ship Creek.

The initial brown bear surveys conducted in the 1980s and early 1990s had limited value as there was no method or guide for determining composition data and ultimately the density or total population of bears in the Ship Creek Watershed. Individual bears were not classified as to age and sex. Repeat surveys in the same area could not distinguish between bears on one survey versus bears on successive surveys. All this has changed with the excellent video presentation prepared by biologists from the Alaska Department of Fish and Game (ADF&G) and Yukon Territory in Canada. The videotape “Bear ID, Take a Closer Look” was produced by Yukon Renewable Resources in 1990. From reviewing the tape several times and applying the lessons learned when locating brown bears on aerial flights, the author has learned to identify individual brown bears with a high level

of proficiency (Enclosure 1). With this new skill, bear composition data can be collected on multiple flights on different calendar dates into the same area to record information which can be useful in determining the total population of brown bears in a defined area.

Brown Bears in Ship Creek in the Year 2000. A series of random surveys were flown into the upper Ship Creek watershed during the summer and fall of the year 2000 to observe and record the brown bears inhabiting the area. Typically, the entire watershed was flown on each survey. The new skills of brown bear identification as to age and sex made it possible to identify and record all brown bears observed during the surveys. The objective was to determine the feasibility of observing a sufficiently large number of brown bears living in a well-defined geographic region to obtain useful spatial and composition data for management of a brown bear population. As the surveys were being conducted in the summer and into the fall of the year 2000, a relatively large number of brown bears were being located, characterized, and recorded. This was my first attempt to systematically survey the brown bears in a well-defined region. There have never been a summer and fall like the year 2000 for obtaining useful bear data from Ship Creek. The promising results from collecting valuable bear composition data is what prompted me to prepare this report.

Brown Bear Data in Ship Creek in the Year 2000. A total of 13 different brown bears were observed, characterized, and recorded in the upper Ship Creek Watershed in the year 2000 (Table 1). Incidental sightings of black bears in Ship Creek in the year 2000 were also recorded and are included in this report (Table 1). The locations of the brown bears were documented on a U.S. Geological Survey map with a scale of 1:63,360 (Figure 1). The locations of black bears observed in Ship Creek in 2000 were also shown on a U.S. Geological Survey map (Figure 2).

Analysis and Significance of the Brown Bear Data Collected in Ship Creek.

A. Spatial Distribution of Brown Bears in Ship Creek. The numerous aerial surveys over the years show that brown bears can be found in all areas of the upper Ship Creek watershed beginning at the western flanks of

the Chugach Mountains near the Fort Richardson dam to the headwaters of the main stem, Ship Lake, the North Fork, and all areas in between. Brown bears are also often found in many side drainages leading into the main valleys of the Ship Creek watershed. Results in the year 2000 show that sighting locations were made from near Alpenglow Ski Lodge, up Ship Creek Valley to its headwaters on the main stem, and at the head of the North Fork. The latter two sightings were found in side valleys off the main stems. It is also apparent from the numerous surveys over the years and especially the year 2000 that the most important local area as determined by the large number of sightings is on the eastern slopes of the Ship Creek Valley approximately 6 air miles up the valley from the Chugach State Park trailhead on Arctic Valley Road. This would be considered a core area or the "heart" of the brown bear habitat in the Ship Creek Valley. It is the most important critical habitat area in the entire Ship Creek watershed for the bears. Surveys in the year 2000 showed 8 brown bears in this so-called heartland habitat (Figure 1). Composition of bears in this area were a dominant male, a sow with three cubs of the year, an adult female, and two subadult bears (siblings). All of these bears observed were spatially located in a 2 mile area along the 1,500 to 2,000-foot contour of the eastern slopes of Ship Creek. Temptation Peak looms high on the horizon across Ship Creek to the west of this area.

B. Composition of Brown Bears in Ship Creek. The composition of the 13 brown bears observed in the Ship Creek watershed in the year 2000 include one dominant male, one sow with two cubs of the year, one sow with three cubs of the year, two subadult males, one adult female, and two subadult bears (siblings). Although the entire population of brown bears in Ship Creek would not be expected to be limited to the 13 sightings in the year 2000, the composition shows a nearly complete and logical number of bears in a defined region of this size. There are no glaring holes of expected data that are missing that can be readily identified. Recruitment into this population from the survey data show five cubs of the year and two subadults (siblings). This indicates a healthy brown bear population with two sets of cubs of the year, one with three cubs and the other with two. The two subadult bears being added to the population in Ship Creek show a healthy continuity between the cubs of the year, the subadults, and the adults.

C. Population of Brown Bears in Ship Creek. When Dave Harkness was an ADF&G biologist for Game Management Unit 14C, which includes the Municipality of Anchorage, the military bases, and Chugach State Park, he often responded to the question of how many brown bears may be in the Ship Creek drainage by saying that perhaps a half dozen bears lived there. Dave's information was based on flying into Ship Creek to conduct annual Dall sheep surveys. Over the years this became the best number anyone had for this drainage. From the survey data collected in 2000, we can see that this previous "best estimate" is far from accurate. A conservative estimate of the number of brown bears living in Ship Creek based on observing 13 bears in the year 2000 would be a total of 15 to 20 bears. The high density of brown bears in this watershed would indicate that this is prime habitat with excellent food sources for the bears.

D. Brown Bear Migration and/or Movement out of Ship Creek. The aerial surveys over the years do not show or indicate that there is a large migration of brown bears from the upper Ship Creek population down onto the coastal plain on Fort Richardson. For example, there is no indication from sightings that large numbers of brown bears move out of upper Ship Creek during the summer months downstream to feed on salmon along lower Ship Creek (downtown Anchorage) or at Sixmile Creek on Elmendorf AFB. There are modest numbers of brown bears on Campbell Creek during the salmon runs in late summer that likely are coming from the Ship Creek population of brown bears. Regional movement of bears from Ship Creek show that a small number do move down Ship Creek along the corridor at the Biathlon Range on Fort Richardson and onto the coastal plain lowlands on the Army Base. The few brown bears observed on the coastal plain on Fort Richardson were sibling bears probably looking for new ranges to explore.

E. The Effects of Moose Hunting on the Brown Bears in Ship Creek. In the 1980s and the early 1990s, frequent Defense of Life and Property (DLP) brown bear kills in Ship Creek were reported to the ADF&G. During those times, hunters used horses in Ship Creek to haul out the meat after shooting a moose. Brown bears were attracted to the kill sites and some of the brown bears were shot. Since the late 1990s and to the present time, very few hunters are now taking horses into Ship Creek for moose hunting. The

younger generation of hunters does not think the boggy trail into Ship Creek is suitable for horses. Presently, there remain a small number of hunters that go into Ship Creek on foot for moose hunting. The meat is hauled out in a backpack. Only a few moose (as few as two or three) are taken each hunting season in Ship Creek since 1999. As a result of this change, the moose population in Ship Creek has doubled in number and no DLP brown bears have been reported killed from 1999 through the hunting season in September 2002. Hunters also backpack into Ship Creek to hunt Dall sheep, which are located primarily in the upper reaches of the main stem and the North Fork. There has been no evidence that sheep hunters are killing brown bears in Ship Creek.

F. The Effects of Recreational Users on the Brown Bears in Ship Creek. A trailhead at approximately 2,200-feet elevation on Arctic Valley Road provides a parking area and entrance to a trail leading down into Ship Creek and Chugach State Park. Hikers and backpackers typically traverse Ship Creek to Indian Creek Pass and continue down Indian Creek to Turnagain Arm. This is a 22-mile trip and usually takes two to three days. The trail follows the valley bottom and many areas are wet peat bogs. In some areas the trail is faint and difficult to locate and follow. In other areas brush is a problem. Due to these limitations, the trail is used by a small number of recreational users in summer. During the winter months, crosscountry skiers use the trail to traverse Ship Creek and continue to Indian Creek and the Seward Highway on Turnagain Arm. Most of the skiers take tents and spend one night camping on the traverse. If a ski trail is recently broken, skiers can travel the entire 22 miles in one long day. For the long, dark nights in winter, skiers use headlamps for finding their way. The light recreational use with small numbers of individuals is not known to have serious consequences for the brown bears in Ship Creek. In the mid to late 1980s, Chugach State Park was contemplating the construction of a “highvolume” recreational trail into Ship Creek. This could have serious and detrimental consequences for the brown bear population in Ship Creek. Evidently, the extensive funding for the construction could not be obtained and the trail was never built. If future plans call for trail construction into Ship Creek, wildlife impacts would need to be carefully examined and the trail route and the modus operandi for trail use would need to be compatible with maintaining the irreplaceable wildlife resources in Ship Creek.

Summary and Conclusions.

The objective of the aerial surveys into Ship Creek was to determine the feasibility of observing a sufficiently large number of brown bears living in a well-define geographic region to obtain useful and accurate spatial and composition data for managing brown bear populations. The surveys conducted in Ship Creek in the year 2000 have provided insight as to the type of spatial and composition data that can be collected from aerial surveys. Whether or not this is the type or quality of information that is needed to manage brown bears populations in Alaska remains in the judgment of my peers in the field of bear biology. If this aerial technique is useful and workable, as I believe it is, it could be used in many other areas in Alaska. My hope is that this is the first of many opportunities of collecting useful data for the management of brown bears in Alaska.

Flying wildlife surveys in Alaska for over 20 years has taught me that a high degree of caution is needed in performing aerial surveys. It is critical to fly a geographical area ample times to become completely familiar with the nuances of the area and to be very creative in determining how to proceed with flying surveys to capture useful wildlife data. What has worked well in Ship Creek may or may not work well elsewhere. If most of the principles used in Ship Creek are followed in conducting aerial surveys in other areas in Alaska, fine-tuning will always be necessary to ensure the best methods are utilized.

The type of aircraft is also critical for flying quality wildlife surveys. A high-performance, backcountry tandem taildragger is the aircraft of choice. Slow flight (50 mph) and turning in shallow arcs are necessary for determine the distinguishing features of brown bears.

[1]William A. Quirk, III is a Biologist/Ecologist with the US Department of Defense at Fort Richardson, Alaska. Bill is also a 27-year Alaskan pilot with his Arctic Tern taildragger based at Merrill Field in downtown Anchorage, Alaska. The views expressed here are his own.

Afterword

A bear biologist in Alaska has indicated that the data from my bear surveys cannot be used to determine the number of bears in a locality because the surveys cannot demonstrate a measure of statistical reliability—it is not possible to duplicate the results that I have obtained. I have always believed in the thinking that all data has significance—certainly some data collected has more reliability than other data collected. In this situation, my bear data has to be compared with no other available bear data.

This “hard science” opinion is discussed in the recent book *Super Brain* (2010) by Deepack Chopra, MD and Rudolph E. Tanzi, PhD, Random House, Inc. Dr. Tanzi (Professor of Neurology at Harvard University and Head of the Alzheimer’s Genome Project) says that “Hard science is proud of its status in society, but I have witnessed firsthand that this pride can extend to arrogance when it comes to considering the contributions of metaphysics and philosophy to developing scientific theories. This broad dismissal of anything that cannot be measured and reduced to data strikes me as incredibly narrowminded. How can it make sense to dismiss the mind, however invisible and elusive it may be, when science is entirely a mental project? The greatest scientific discoveries of the future often begin as pipe dreams of the past.”

Table 1. Bears observed in upper Ship Creek in summer 2000

Date	**Brown Bear(s)**	**Location**
July 6	1 Subadult Male	Upper Main Stem
July 7	2 Subadults[1]	Temptation Peak
September 7	1 Adult Female	Temptation Peak
September 15	1 Sow + 2 COY	Organ Mountain
September 16	1 Sow + 3 COY	Temptation Peak
September 17	1 Subadult Male	Alpenglow
September 29	1 Adult Male	Temptation Peak
Total	**13 Bears**	

[1]Sibling Bears

Date	Black Bear(s)	Location
June 11	1 Mating Pair	Biathlon
July 6	2 Adults[1]	Upper North Fork
July 22	2 Adults[1]	Jct. North Fork
Total	**6 Bears**	

1Sightings on July 6 and July 22 were probably mating pairs of black bears that had recently separated. They were observed 100-200 yards apart.

MEMORANDUM 45

SUBJECT: Brown Bears Observed on the Karluk River (Kodiak Island)

June 30, 2001

1. I organized a sport fishing trip by inflatable raft on the Karluk River during the period June 14 through 19, 2001. Phil Pierce from Virginia and Gene Deal from Colorado were my guests. Red salmon (sockeye) were plentiful in the river and we caught many silver beauties on flies with a fly rod from Karluk Lake 18 miles downriver to Karluk Lagoon. King salmon were scarce in the river and only two kings were caught. Both kings had already changed to spawning colors. This was my first float trip in 21 years on the Karluk River that silver-colored kings were not plentiful on the lower 11 miles of the river from French Camp downstream to Karluk Lagoon.

2. The Karluk River with king and red salmon in bright silver colors in mid-June has been the most enjoyable wilderness fishing river imaginable. We fly a commercial airline from Anchorage to Kodiak and hire a float plane from Kodiak to Karluk Lake, a one hour flight. We booked dependable Steve Harvey in his Grumman Widgeon for many years. Every year I organized a trip with two to four cohorts to float the 18 mile long river and fly fish for reds and kings. The Karluk River is shallow and chest waders provide protection from the icy water when fishing the energetic reds and horse-bucking kings. For their size from 4 to 8 pounds, red salmon are among the hardest-fighting fresh water fish. Catching reds on a number 6 or 8 fly rod is a super delightful experience. The kings (weighing from 15 to 45 pounds) are one of the most challenging fresh water fish caught on spinning rods. However, on the Karluk River most of us opted for a number 10 or 11 fly rod. My old faithful is my Sage Number 11 which has never shattered when bending under enormous pressure with a feisty king. When a king takes your fly, there is no way to hold it. You run up and down the river following the king until the fish tires; then you reel in and slowly exert pressure to slow the fish down. Now it depends on who gets tired first—the fish or the fisherman. This will determine whether or not you will bring this

king to shore. It is not unusual to battle a king in the Karluk River for half an hour or more.

3. The numbers and locations of brown bears observed on the Karluk River during the June 2001 float trip from the lake to the lagoon are shown in Table 1. Brown bears are thick in this part of Kodiak Island; however, mid-June is during the breeding season and the bears are away from the river in more peaceful environments. The bears flock to the river in July and feast on tired and dying red salmon. The average number of bears I have observed per year floating the Karluk River from 1975 to 1998 is 4. River-fishing trips on the Karluk were not made in 1999 and 2000. The large number of bears sighted in 2001 (12 bears) is the largest number on all my 21 float trips down the river. The weather was sunny and warm for the entire river trip in 2001. No rain! Very little wind! This is very unusual weather for Kodiak Island.

Table 1. Numbers and locations of Brown Bears on the Karluk River in June 2001

Date	Time	Bears and Location
June 14	9:20 PM	Sow + 3 Yr cubs on the NW side of Karluk Lake
June 16	12:40 PM	Mating pair 1 mile downstream from Big Bend
June 16	4:20 PM	Subadult female at French Camp
June 16	5:05 PM	Subadult Male at French Camp
June 18	12:10 PM	Subadult male ¼ mile upstream from ADF&G Weir
June 18	10:10 PM	Sow + 2 Yr cubs near Karluk Airport
		Total number of bears observed = 12

MEMORANDUM 46

SUBJECT: Surprising Bear Survey in the Ship Creek Watershed

October 10, 2005

1. On some days it seems like all the bears are out on the mountain slopes. They are not difficult to locate and on these days it is likely that you can observe a record number of bears in the area being surveyed. This glorious day was Friday, October 7, 2005. The aerial survey began at 5:48 PM in my Arctic Tern taildragger based at Merrill Field in Anchorage, Alaska. The flying was completed in 1.3 hours. The first area surveyed was on the western flanks of Site Summit. Occasionally a brown or black bear can be found here. I looked over the slopes and did not find any bears. As I was leaving the area, my eye caught something in the landscape. I made a complete circle in the Arctic Tern and came back around and lo and behold, there were the black bears that I had been looking for since early July when they were sighted at McVeigh Marsh within ¼ mile of the Glenn Highway. The black bear sow had three spring cubs. This is the first black bear sow with three cubs I had observed on Fort Richardson since flying surveys during the past 20 years. I circled and managed to get digital images of the bears.

2. Now flying to Ship Creek and the home of the majestic brown bears in the Chugach Mountains. I observed three solitary adult brown bears on the eastern mountain slopes of Ship Creek opposite Temptation Peak. All these bears were in subalpine habitats at elevations from 1,500 to 2,600 feet above sea level. The bears were feeding on blueberries and other types of vegetation on the mountain slopes. Distance between bears varied from ¼ to 1 mile. The winds were blowing 20 miles per hour as I flew up the north fork of Ship Creek. The winds produced turbulent flight so I turned around and headed for the western slopes of Ship Creek near Temptation Peak. Bears are usually found here.

3. While flying at about 3,500 feet elevation, I located brown bears below on a large knoll at almost 3,000 feet elevation. I circled and got a good look at the sow with three spring cubs (cubs of the year). The bears were in deep shadows and in small creek drainage along the southeast end of Temptation Peak. I could not circle comfortably in the Tern and could not get any images with the camera. I'd hoped to see them again in a better location. I observed a brown bear sow on October 1, 2005 with three yearling cubs on the eastern slopes across Ship Creek from here. Sows with three cubs are very rare in Ship Creek. These are only the second and third brown bear sows I have observed with three cubs in Ship Creek while conducting surveys since 1985. Brown bears in Ship Creek usually have two cubs. One other brown bear was located on the western slopes of Ship Creek near the north end of Temptation Peak. This completed the bear survey.

4. This is one of my most productive bear surveys in Ship Creek over the years. A dozen bears were found on the survey. On many surveys no bears are found! Finding the black and brown bear sows, on the same day, both with 3 cubs, is rare and so very special.

MEMORANDUM 47

SUBJECT: Aerial Black Bear Survey in Ship Creek and Eagle River

June 25, 2001

1. An aerial back bear survey was conducted beginning at 11:35 AM on June 24, 2001 in the upper parts of Ship Creek and Eagle River. The area surveyed in Ship Creek includes the watershed upstream from the High Dam to the headwaters in the Main Stem and the North Fork. The area surveyed in Eagle River includes the watershed upstream from the Gates (opposite Mt. Yukla) to Eagle Glacier. The survey was flown in my Arctic Tern taildragger based at Merrill Field in Anchorage. The temperature was in the low 60s Fahrenheit. The skies were obscured with a thin overcast at 5,000 feet ASL. Isolated fog patches were present in the valleys. Light rain was observed approaching Eagle Glacier.

2. A total of 10 black bears were observed on the survey. Nine of the black bears were observed in Eagle River and one in Ship Creek. All sightings were in the subalpine and alpine vegetation zone from 2200 to 4200 feet ASL. The bears observed near the Mountaineering Club of Alaska hut on a small rocky ridge protruding out of Eagle Glacier at over 4,000 feet ASL were a surprise. They had to cross a half mile of glacial ice on a lobe of Eagle Glacier to get to the cabin site. Figure 1 shows the location of the black bear observed in Ship Creek. Figure 2 shows the location of the black bears observed in Eagle River.

3. It was very unusual to see this many black bears on a single survey. It was obvious that the climatic conditions were unusual at the time of the flight and many of the black bears in the area flown were out and about on mountain slopes in the subalpine where they could easily be sighted. When unusual conditions such as this are apparent, it is important to take advantage of the opportunity and conduct comprehensive surveys.

4. A sharp contrast to seeing so many black bears is that no brown bears were observed on this survey. The few brown bears that have been observed

in June this year have been in the valley bottoms in forested areas. They are very difficult to locate and observe under these conditions. Sightability will not improve for the brown bears until they move onto the subalpine mountain slopes in September and October as they prepare for winter hibernation.

MEMORANDUM 48

SUBJECT: Black Bears Observed on Fort Richardson and Ship Creek Drainage in 2003[1]

December 28, 2003

1. The number of black bears observed flying over Fort Richardson and the upper Ship Creek drainage during the past 15 years has been approximately 8-12 bears per year. Rarely do I remember finding more than a dozen in any one summer. The summer of 2003 has been exceptional due to the large number of sightings of black bears on aerial surveys into these areas. Several sightings by other pilots and surveys on the ground by fellow employees have greatly helped to boost the number of bears sighted in 2003.

2. In 2003, a total of thirty-five (35) black bears were observed on Fort Richardson and upper Ship Creek drainage (Table 1). Footnotes 2, 3, 4, and 6 in Table 1 denote black bear observations by others than the author. Of the 35 black bears observed during this time period, twenty-eight (28) were observed on Fort Richardson, one (1) on Elmendorf AFB and six (6) were observed in upper Ship Creek drainage (Chugach State Park). The site locations of the black bears that were observed during this time period are shown in Table 2.

3. The minimum number of black bears observed in 2003 in the areas surveyed was thought to be thirty-two (32) black bears. The only obvious repeat observations were, as follows: (1) Sub adult bear observed on May 19 down slope from the Army Ski Lodge parking lot which was sighted again on June 22 in the same area; (2) Adult bear observed on Oilwell Road on the South Post of Fort Richardson on August 24 and observed again on September 26 near the Ship Creek Bridge off of Arctic Valley Road; and (3) Sub adult bear observed on May 22 near the Ship Creek Dam and sighted again on June 22 on a bench near the Biathlon Range. All of the repeat bear sightings were on Fort Richardson.

4. Other black bear observations by the author during aerial flights in the summer of 2003 that were not on military land or the upper Ship Creek drainage include the following sightings: (1) Adult bear at 3,000 feet elevation on Bear Mountain (above Mirror Lake along the Glenn Highway); (2) Female with three spring cubs in an alpine bowl at 3,400 feet elevation on the north side of Pioneer Peak; (3) Two sub adult black bears along the mountain slopes of the Chugach Mountains north of Knik River; and (4) Numerous (six to eight) black bears observed in the Lake George Basin south of Knik Glacier.

5. In all of the flights over Fort Richardson in summer 2003, the author did not observe a brown bear. This is the only year I can recall not seeing two or more. Several brown bears (approximately 3) were reported to have been observed from the ground along roads and trails on Fort Richardson in 2003. The author observed eight (8) different brown bears in upper Ship Creek Valley (Chugach State Park) on aerial surveys in 2003.

6. The minimum number of black bears observed on Fort Richardson during the summer and fall of 2003 was twenty-five (25) bears (Table 3). Composition of the minimum number of bears on Fort Richardson is, as follows: 4 females with offspring; 5 Spring Cubs; 5 Yearling Cubs; 7 Sub Adults; and 8 Adults for a grand total of 25 bears. A Pie Chart is attached that shows the black bear composition on Fort Richardson according to age. The cub litter size was 2.5 which is close to Bostick's2 litter size of 2.6.

7. It is always very difficult to estimate the total population of bears in a defined area from survey data. A Correction Factor is needed to fill in the number of bears missed during the surveying effort. In Bostick's[2] black bear study on the two military installations, he found that the bears are highly mobile, especially the males and other bears without cubs. This means that bears moving onto and off of the military reservations occur frequently. This creates difficulty in determining a realistic Correction Factor. Nevertheless, the bountiful survey data collected during the summer of 2003 may not be so easily repeated any time in the near future. This may be the best opportunity to estimate the total number of black bears occupying the Fort Richardson Army Reservation.

8. Although some of Bostick's techniques were not according to the Scientific Method, his study is the only one which has attempted to estimate the actual number of black bears on the two military installations. His population estimate technique involved identifying known family groups of radio-collared sows with cubs and extrapolating these numbers to account for areas of suitable habitat occupied by family groups which had not been captured and collared. This was based on consistent sightings of uncollared bears with cubs in these areas. Bostick then added a certain number of males based on the male / female ratio reflected by the known collared animals. Using this technique, Bostick calculated a black bear population for the two military bases of 30-42 animals excluding cubs of the year (COY). Adding COY to Bostick's estimates would equal a total population in the neighborhood of 38-50 black bears on the two military bases.

9. The projected or estimated population for the Fort Richardson black bears was calculated by using a conservative Correction Factor of 30% added to the survey results of 25 bears (Table 3). Calculations show the projected population on Fort Richardson to be 33 black bears in 2003. For all the years of flying surveys over this area, I did not suspect the numbers would be this high. It is likely that the year 2003 is showing a spike in the black bears population in this area and that this is the reason for the large number of black bears on Fort Richardson.

10. Although it is widely known that black bears go back and forth between the military installations, especially between Sixmile and Otter Lakes, the author did not fly any surveys in this area in summer 2003. This area is difficult to fly because it is in Elmendorf's Flight Pattern when aircraft take off from Runway 5. With the bears missed in this area added to the totals, the estimates for Fort Richardson's black bears do seem to substantiate the number somewhat closely with the results in Bostick's study.

[1]Memorandum and aerial flights by William A. Quirk, lll, Environmental Scientist / Biologist, Department of Defense, Fort Richardson, Alaska. The author is a seasoned Alaskan pilot with his Arctic Tern taildragger based at Merrill Field in Anchorage. The views expressed here are his own.

[2]Bostick, D.P. (1997). A Preliminary Report on the Ecology, Behavior, and Management of Nuisance Black Bears on Military Lands within the Municipality of Anchorage. Joint Black Bear Study, Elmendorf Air Force Base and Fort Richardson, Alaska.

Table 1. Black Bears Observed on Fort Richardson and the Upper Ship Creek Drainage in Chugach State Park, Southcentral Alaska, Year 2003

Date	Females & Cubs	# of Cubs/Age	Sub Adult Bears	Adult Bears	Total Bears
May 19			1		1
May 22			1		1
May 24			1[1]		1
May 29	1[2]	4 (Yearling Cubs)		1	5
Jun 2				1	1
Jun 6				1	1
Jun 8			1		1
Jun 8				1	1
Jun 8	1	1 (Spring Cub)		1	2
Jun 12	1[3]	2 (Spring Cubs)		1	3
Jun 16			1		1
Jun 18	1[4]	3 (Spring Cubs)		1	4
Jun 22				1[5]	1
Jun 22				2	2
Jun 22			1		1
Jun 22			1		1
Jul 6				1	1
Jul 28			2[6]		2
Aug 24				1	1
Sept 26				1	1
Sept 26	1	1 (Yearling Cub)		1	2
Oct 18				1	1
Total	**5**	**11**	**9**	**15**	**35**

[1]Sub Adult bear observed on Elmendorf AFB during an aerial raptor survey.

[2]Reported by Joe Mets on an aerial flight. Images of the bears were recorded on a Digital Camera. Cubs were very large and may have been 2 year old cubs instead of yearlings.

[3]Reported by Brandon Berta from a lookout onto Eagle River Flats.

[4]Reported by Paul Woodward on an aerial flight.

[5]A very large and dominant black bear was observed pressuring a female brown bear in upper Ship Creek. Author circled overhead for 40 minutes while black bear forced brown bear up slope to about 2,200 feet in sub alpine habitat. Then they both disappeared into the alders. Images of the bears were recorded on a digital camera.

[6]Two sibling black bears observed by Chris Garner while driving on Arctic Valley Road. Images of the siblings were recorded on a digital camera.

Table 2. Site Location of Black Bears Observed on Fort Richardson and Upper Ship Creek Drainage in Chugach State Park, Year 2003

Date	Elevation (Ft)	Location of Black Bears
May 19	1,900	Sub adult down slope from Army Ski Lodge
May 22	800	Sub adult on gravel road near Ship Creek Reservoir
May 24	200	• Sub adult east of Boniface along Ship Creek on Elmendorf AFB
May 29	400	Sow+4 Cubs on Helicopter LZ 71 (South Post of Ft. Richardson)
Jun 2	330	Adult killed on Glenn Highway (NE of Muldoon Interchange)
Jun 6	220	Adult crossing Route Bravo east of Eagle River Flats
June 8	320	Sub adult in Chester Creek wetlands on Army South Post
June 8	1,200	Adult near Biathlon Range on Fort Richardson (Arctic Valley Road)
June 8	1,420	■ Sow+1 Cub on east slopes of Ship Creek in cottonwood forest
June 12	10	Sow+2 Cubs on northeast side of the Eagle River Flats.
Jun 16	1,350	■ Sub adult in wetlands in bottom of Ship Creek (east slopes)
Jun 18	620	Sow+3 Cubs on lower end of 5-Mile Trail near Arctic Valley Road
Jun 22	1,500	■ Dominant black bear on west slopes of Ship Creek (Temp. Peak)
Jun 22	1,360	■ Two adults on west slopes of Ship Creek
Jun 22	1,950	Sub adult down slope from Army Ski Lodge parking lot
Jun 22	1,160	Sub adult on bench near Army Biathlon Range
Jul 6	580	Adult ¾ mile north of Cochise Lake (South Post of Fort Richardson)
Jul 28	470	Two siblings east of Moose Run Golf Course on Arctic Valley Road
Aug 24	510	Adult on Oilwell Road (South Post of Fort Richardson)
Sept 26	490	Adult on Oilwell Road north of Ship Creek
Sept 26	1,960	Sow+1 Cub down slope from Army Ski Lodge parking lot
Oct 18	2,100	Adult on western slopes of Chugach Mountains

Oct 18	2,100	Adult on western slopes of Chugach Mountains above Cochise Lake

• Black bear observed on Elmendorf AFB
■ Black bears observed in the upper Ship Creek Valley (Chugach State Park)
(All other entries are black bears observed on the Fort Richardson Military Reservation)

Table 3. Minimum Number of Black Bear Observations on the Fort Richardson Military Reservation during the Year 2003

Females with Cubs	# Cubs/Age	Sub Adult Bears	Adult Bears	Total Bears
1	4 (Yearling Cubs)[1]		1	5
1	2 (Spring Cubs)		1	3
1	3 (Spring Cubs)		1	4
1	1 (Yearling Cub)		1	2
		7		7
			4	4
Total 4	**10**	**7**	**8**	**25**

[1]These cubs were very large in size and may have been 2 year old cubs.

MEMORANDUM 49

SUBJECT: Trumpeter Swan Survey—Palmer, Alaska Region

October 19, 2010

1. This was the forty-first trumpeter swan survey in the Knik River Drainage (KRD) and the Palmer Hay Flats (PHF) in 2010. This was the seventeenth fall survey for migrating swans. The survey began at 2:40 PM on October 19, 2010. The weather was overcast. Winds in the KRD were blowing 30 to 45 miles per hour from the southeast. The Arctic Tern was experiencing moderate turbulence while flying into the KRD. The flying was difficult and was at the maximum tolerance level. Ambient temperature was 45 degrees Fahrenheit.

2. The total number of swans in the Duck–Swan Lake staging area on October 19, 2010 was 1,191 (Table 1). There were 1,175 swans in the KRD whereas only 16 swans were found in the PHF. There were 1,175 swans in the Jim Creek basin lakes. The largest number of swans in the Jim Creek basin lakes was found on Swan Lake with 540 swans.

3. No power boats were found in the Jim Creek basin today. The spatial distribution and number of migrating swans in the various lakes shows the swans' preference for the Jim Creek basin over Duck Lake and the PHF. The lakes in the Jim Creek basin with the highest swan use were, in the following order: Swan, Leaf, and Mud. Swans are normally not found in large numbers in Mud Lake because of the boat launch and the many power boats traveling through the lake to Jim Creek. The total of 1,191 swans on October 19, 2010 was the peak number during the fall 2010 migration period.

Table 1. Trumpeter Swan Survey-KRD/PHF on October 19, 2010

Location	Swans Observed
Gravel Pit Pond	
Barbel Lake	

Foot Lake	
Total Knik River Road	
Finger Lakes	
Chain Lakes (West)	95
Leaf Lake	260
Little Leaf Lake	
Swan Lake	540
Jim Lake	55
Gull Lake	
Mud Lake	225
Knik River Gravel Bars	
Total Jim Creek Basin	**1175**
Total Knik River Drainage	**1175**
Duck Lake	16
Ponds in Marsh West of Duck Lake	
Total Palmer Hay Flats	**16**
Total KRD/PHF	**1191**

MEMORANDUM 50

SUBJECT: Trumpeter Swan Survey in the Palmer, Alaska Region

September 8, 2012

1. This was the seventeenth swan survey in the Palmer Hay Flats (PHF) and the Knik River Drainage (KRD) in 2012. The survey commenced at 1:25 PM; sunny day with thinly overcast skies and light wind. The ambient temperature on the Knik River was 48 degrees Fahrenheit. The survey was conducted in my Arctic Tern taildragger based at Merrill Field in Anchorage, Alaska.

2. Thirteen nesting pairs of trumpeter swans were monitored on September 8, 2012 (Table 1). All nesting swans and their broods of cygnets were found although the moose and waterfowl hunting seasons had opened. The hunting seasons are very stressful for the swans—air boats and motorboats coming too close. They get chased and often move to more tranquil environs. The Gull Lake swans moved from their primary feeding grounds on the east side of Gull Lake to the west side of the lake. The Jim Creek swans were in the east end of the lake. A motorboat was moving toward the swans. I did not wait to see what happened. Fresh all-terrain cycle tracks were observed near the Chain Lake swans. One cygnet was missing from the last count on August 29, 2012. The Foot Lake swans were still in Barbel Lake. The lower Knik River swans were 1 mile from their nesting grounds on an island in the Knik River. These swans were shielded from human disturbance.

3. The Cabin Lake swans were back on Cabin Lake. The Wasilla Creek swans (three pairs; all pairs with broods of cygnets) don’t have any human motorized disturbance and were doing well. The swans west of the Matanuska River Bridge were still on the east side of the Glenn Highway in the Ducks Unlimited ponds. They had a limited amount of human disturbance this summer. Most of their summer was in the Duck Unlimited Ponds (since late June).

4. Fifty Dall sheep were on the Chugach Mountain slopes at Wolf Point. This is winter habitat for the sheep. Sandhill cranes were flying over the Chugach Mountains at 5,000 feet above sea level on their outward migration from Alaska. They were flying toward Prince William Sound.

Table 1. Nesting Pairs of Trumpeter Swans in the Palmer, Alaska Region on September 8, 2012

Location of Nesting Pairs	Swans with Cygnets	Other Swans	Total Swans
01. Cabin Lake	Pr+4		6
02. Wasilla Creek (Lower)	Pr+4	Flk 12; Flk 3, S	22
03. Wasilla Creek (Upper)	Pr+3	Pr	7
04. Wasilla Creek (Head)	Pr+5		7
05. Matanuska Bridge (West)	Pr+6	Pr; Flk 3	13
06. Gull Lake	Pr+4		6
07. Jim Lake (Slough)	Pr+2		4
08. Chain Lake (East)	Pr+6	Pr	10
09. Lake George Basin	Pr+2	Flk 3; Flk 4; Pr	13
10. Hunter Creek (East)	Pr+5		7
11. Hunter Creek (West)	Pr+3		5
12. Foot Lake	Pr+5		7
13. Knik River (Lower)	Pr+5	Pr	9
Total Swans	**Cygnets: 54**	**36**	**116**

Pr (Pair); Flk (Flock); S (Single)

MEMORANDUM 51

SUBJECT: Trumpeter Swan Survey in the Susitna Flats

August 22, 2012

1. This was the seventh trumpeter swan survey in the Susitna Flats in the year 2012. The survey area included the Cook Inlet coastal marsh (1-2 miles inland from salt water) from Point MacKenzie (junction of Knik Arm and Cook Inlet) west to the Susitna River, southwest to the Beluga River, and including the lower Susitna River north to Flat Horn Lake and Susitna Station. The swans in this area were found in freshwater bodies that are inland from the coastal saltwater marshes. The goal was to fly surveys during the summer months to monitor nesting pairs of swans and their cygnets. The survey began on August 22, 2012 at 11:10 AM and required 2.1 flying hours. The weather was sunny with thin overcast skies and light winds. The ambient temperature was 56 degrees Fahrenheit. The survey was conducted in my Arctic Tern taildragger based at Merrill Field in Anchorage, Alaska.

2. Seventeen pairs of nesting swans were monitored in the Susitna flats on August 22, 2012 (Table 1). One pair of nesting swans could not be found on this survey. These were the Susitna River (Island) swans. Point MacKenzie swans had moved 3 miles west from their nesting site. The Little Susitna East swans had adult mortality on July 6. One adult swan was found dead on the bank of an unnamed creek near the powerlines. The other adult swan and two cygnets remained here until early August. On August 9, the two cygnets and a pair of adults were found back on the Susitna Flats 2 miles southwest of the creek. Evidently, the one adult picked up a mate on the Susitna Flats after a one-month residency in the creek area. The Susitna River West swans spent most of the summer 2 miles west of their nesting site on Maguire Creek. Now they had moved to a creek on the east side of the Little Susitna River. The Figure Eight swans had been found only three times since the cygnets hatched on a small lake near Figure Eight Lake. They were found on this survey on the south end of Figure Eight Lake.

Table 1. Trumpeter Swan Nesting Survey in the Susitna Flats (August 22, 2012)

Location of Nesting Pairs	Swans with Cygnets	Other Swans	Total Swans
01. Point MacKenzie	Pr+3	Pr	7
02. Little Susitna River (East)	Pr+2	Pr, Flk 3	9
03. Little Susitna River (West)	Pr+5		7
04. Figure Eight Lake	Pr+3		5
05. Susitna River (East)	Pr+3		5
06. Susitna River (Island)	Not Found	Pr, S	3
07. Susitna River (West)	Pr+2		4
08. Ivan River (Upper)	Pr+5	Pr	9
09. Ivan River (Powerline)	Pr+2		4
10. Chedatna Lake	Pr+3	Pr	7
11. Beluga River (North)	Pr+2	Flk 10	14
12. Beluga River (South)	Pr+3		5
13.Susitna (West) N of PL	Pr+3		5
14. Fish Creek (Lower)	Pr+3		5
15. Maid Lake	Pr+2		4
16. Fish Creek (Upper)	Pr+4		6
17. Flathorn Lake (West)	Pr+3	2 Pr	9
18. Susitna Station	Pr+4		6
Total Swans	**Cygnets: 52**	**28**	**114**

Pr (Pair); Flk (Flock); S (Single)

MEMORANDUM 52

SUBJECT: Trumpeter Swan Cygnet Success in the Palmer, Alaska Region in 2012

November 20, 2012

1. Thirteen pairs of trumpeter swans nested and reared broods of cygnets in the Knik River Drainage (KRD) and the Palmer Hay Flats (PHF) in the summer of 2012 (Table 1). The total number of cygnets from the nesting swans in late June was 58. The total number of cygnets fledged was 49, resulting in a cygnet loss in summer 2012 of 9. Survivability for the cygnets in 2012 was 85 percent. This was considered a highly successful year. The number of nesting pairs of swans in the Palmer, Alaska Region in 2012 was the highest recorded in the past six years. No attempt was made to count the total number of cygnets hatched from the nest as the cygnets cannot be accurately counted from aerial observations at this time of year.

2. Cygnets die from natural causes such as injuries, chronic health problems, and predator attacks. Humans in the PHF and the KRD disturb the nesting swans and their broods of cygnets especially during the moose- and duck-hunting seasons in August, September, and October. Human disturbance of swans by operators of power boats and all-terrain cycles (ATCs) would tend to contribute to the loss of cygnets as nesting pairs are likely to abandon their traditional nesting grounds and move overland to a more protected site. These long movements across marshes, wetland tussocks, alder and willow thickets, and forested areas can stress out and greatly reduce the stamina of the cygnets, can cause injury to the young cygnets and can also exposed the cygnets to predator attacks.

3. Two adult swans from the nesting pairs in the Palmer, Alaska Region were killed this summer. The Wolverine Lake nesting swans suffered a death in mid-June near the time the cygnets were hatching. The owners of Wolverine Lake Chalet informed the author of what happened. They said two boys escorted dogs to the swan nesting site on the east end of the lake and then turned the dogs loose on the swans for the amusement. One adult

swan was killed and was observed floating on the vegetation mat on the lake. No cygnets were observed. The lodge owners said the same two boys killed all the beavers in the lake. The other adult swan found missing was from the Jim Lake nesting pair with a brood of two cygnets. This was first observed on October 1, 2012 when only one adult was with the cygnets. The single swan with the cygnets was found again on October 6 and October 9. There is no information on what happened to the missing swan. Jim Lake has a road to the north lake shore and many people arrive here for boating on the lake. The other nesting swans on Jim Lake in past years never succeeded in rearing cygnets to fledging. A pair of nesting swans were shot and killed on Jim Lake a few years ago.

Table 1. Nesting Trumpeter Swans: Knik River Drainage/Palmer Hay Flats in 2012

Location of Nesting Swans	Cygnets in June	Cygnets Fledged*	Cygnet Loss
01. Cabin Lake	4	4	0
02. Wasilla Creek (Lower)	4	4	0
03. Wasilla Creek (upper)	5	3	2
04. Wasilla Creek (Head)	5	4	1
05. Matanuska River Bridge	6	3	3
06. Jim Lake	3	2	1
07. Gull Lake	4	3	1
08. Chain Lake (East)	7	7	0
09. Lake George Basin	2	2	0
10. Hunter Creek (East)	5	5	0
11. Hunter Creek (West)	3	2	1
12. Foot Lake	5	5	0
13. Knik River (Lower)	5	5	0
Totals	**58**	**49**	**9**

*Cygnets fledged (able to fly) in late September
Average brood size for newly hatched cygnets in June 2012: **4.46**
Average brood size for newly fledged cygnets in 2012: **3.77**
Cygnet survivability in 2012: **85%**
Nesting surveys flown in 2012: **15**

MEMORANDUM 53

SUBJECT: Trumpeter Swan Cygnet Success in the Susitna Flats in 2012

November 20, 2012

1. Eighteen pairs of trumpeter swans nested and reared broods of cygnets in the coastal marshes of the Susitna Flats in 2012 (Table 1). The total number of cygnets from the nesting swans in late June was 57. The total number of cygnets that fledged was 53, resulting in a cygnet loss in summer 2012 of 4. Survivability for the cygnets in 2012 was 93 percent. This was the largest number of nesting pairs of swans in this survey area during the past four years. The cygnet survivability for 2012 at 93% is among the highest recorded in the Susitna Flats and the Palmer, Alaska region since 2008. No attempt was made to count the total number of cygnets hatched from the nest as the cygnets can not be accurately counted from aerial surveys at this time of the year. There was no indication that human disturbance has negatively affected the nesting swans in the Susitna Flats marshes in the summer of 2012.

2. One adult from the pairs of the nesting swans in the Susitna Flats died in early July 2012. This was the Little Susitna River East pair of nesting swans. The dead swan was observed on July 6, 2012 on the bank of a creek near the powerlines, east of the Little Susitna River. The single swan and her two cygnets moved down the creek into the Susitna Flats marshes near the Little Susitna River. A survey on August 11, 2012 confirmed her presence and also showed that she had picked up a mate. These newly paired nesting swans with two cygnets were observed several times after the first sighting to confirm this finding.

3. Massive flooding of the Lower Susitna River and Flat Horn Lake occurred in late September 2012. A survey on September 27, 2012 showed the flooding of the river and sloughs. Flat Horn Lake was expanded in size by about 40 percent by backup water from the Susitna River. The flooded waters from the Susitna River were heavily laden with silt and clay. The

swans don't like the muddy water—most of them moved away from the river into marshes with clear water. The nesting pairs of swans and cygnets were widely scattered and very difficult to locate.

Table 1. Nesting Trumpeter Swans in the Susitna Flats in 2012

Location of Nesting Swans	Cygnets in June	Cygnets Fledged*	Cygnet Loss
01. Point MacKenzie (West)	3	2	1
02. Little Susitna River (East)	2	2	0
03. Little Susitna River (West)	5	5	0
04. Figure 8 Lake (East)	3	3	0
05. Susitna River (East)	3	2	1
06. Susitna River (Island)	2	2	0
07. Susitna River (West)	3	3	0
08. Ivan River	5	5	0
09. Ivan River (Powerline)	2	2	0
10. Chedatna Lakes (West)	3	3	0
11. Beluga River (North)	3	2	1
12. Beluga River (South)	3	3	0
13. Chedatna Lakes (North)	3	3	0
14. Fish Creek (Lower)	3	3	0
15. Maid Lake	3	2	1
16. Fish Creek (Upper)	4	4	0
17. Flathorn Lake (Northwest)	3	3	0
18. Susitna Station (South)	4	4	0
Totals	**57**	**53**	**4**

*Cygnets fledged (able to fly) in late September
Average brood size for newly hatched cygnets in June 2012: **3.17**
Average brood size for newly fledged cygnets in 2012: **2.94**
Survivability for cygnets in 2012**: 93%**

Nesting surveys flown in 2012: **10**

MEMORANDUM 54

SUBJECT: Abstracts of Trumpeter Swan Papers

February 20, 2013

1. Three Trumpeter Swan Papers were written in 2011. Two of my Papers were presented at the Twenty-Second Conference of The Trumpeter Swan Society held in Polson, Montana on October 13, 2011. These two papers will be published in 2013 in North American Swans, Special Edition, Proceedings and Papers of the Twenty-Second Swan Society Conference. This is a Bulletin of The Trumpeter Swan Society, Plymouth, Minnesota. A copy of my third Paper ("Swan Disturbances in the Palmer, Alaska Region") was provided to John Cornely, Executive Director of The Trumpeter Swan Society. He will review it and decide whether to publish it in the Proceedings.

2. Below are the Abstracts for my three Trumpeter Swan Papers.

A SUMMARY OF THE STATUS, NESTING SUCCESS AND CYGNET SURVIVABILITY OF THE RESIDENT POPULATION OF TRUMPETER SWANS IN THE KNIK RIVER DRAINAGE AND THE PALMER HAY FLATS STATE GAME REFUGE, ALASKA

William A. Quirk, III, P. O. Box 212545, Anchorage, Alaska 99521-2545

ABSTRACT

Comprehensive aerial surveys of Trumpeter Swans (Cygnus buccinator) were completed during May through September 2008-10 in the Knik River Drainage and the Palmer Hay Flats State Game Refuge, Alaska to determine the population status, nesting success and cygnet survivability. Results show a resident population of 62-91 swans during the three year survey period. The average resident population was 40.7 white swans including an average of 10.0 pairs of nesting swans. The nesting swans reared an average of 39.0 fledged cygnets. Nesting success for the swans well into the incubation period is very high (90-100%). Cygnet survival to

fledging averaged 81% for the 3 year period and reached a remarkable 94% in 2008. Disturbances by humans and motorized recreational activities appeared to be limiting swans choosing nesting sites in this region.

STAGING STRATEGIES OF TRUMPETER SWANS IN THE KNIK RIVER DRAINAGE AND THE PALMER HAY FLATS STATE GAME REFUGE, ALASKA

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ABSTRACT

Aerial surveys of migrating Trumpeter Swans (Cygnus buccinator) in the Duck-Swan Lake staging area of the Knik River Drainage and the Palmer Hay Flats State Game Refuge, Alaska were conducted during 2008-11 to better understand temporal and spatial use in the region. Twenty-nine daily autumn surveys in 2010 (28 September and 4-31 October) and eight bi-weekly spring surveys in 2011 (9 April through 8 May) showed differing preferences for staging lakes by season. Autumn staging numbers for swans peaked at 1,240 on 21 October 2010. The Duck-Swan Lake staging area provided 18,360 total swan-use-days in the autumn migration in 2010 with swans preferring Swan Lake. Peak spring swan numbers in 2011 approached 1,500 swans on 27 April with a preference for Duck Lake. Disturbance levels by humans and food availability appeared to dictate the staging preferences.

TRUMPETER SWAN DISTURBANCES FROM MOTORIZED RECREATION AND HUNTING IN THE KNIK RIVER DRAINAGE AND THE PALMER HAY FLATS STATE GAME REFUGE, ALASKA

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ABSTRACT

Monitoring motorized recreation and hunting disturbances negatively affecting Trumpeter Swans in the Knik River Drainage and the Palmer Hay Flats evolved out of completing basic aerial swan surveys. The data collected on these basic swan surveys was used to write and submit two

swan papers for publication. Surveys to collect the basic swan data in concert with monitoring motorized recreation and hunting swan disturbances have been flown by the author in the region near Palmer, Alaska for more than 15 years. Findings show consistently widespread and high swan disturbance levels by motorized recreational users and hunters which negatively impact the resident swans including nesting pairs of swans with cygnets and several thousand migrating swans that make use of the important Duck-Swan Lakes staging area. The author is recommending responsible land managing agencies in the region support a collaborative effort to regulate motorized recreation and hunting activities that are negatively impacting the swans.

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