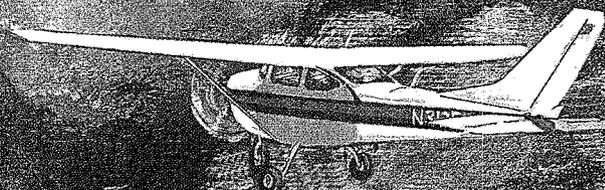


# The Skylane Pilot's Companion

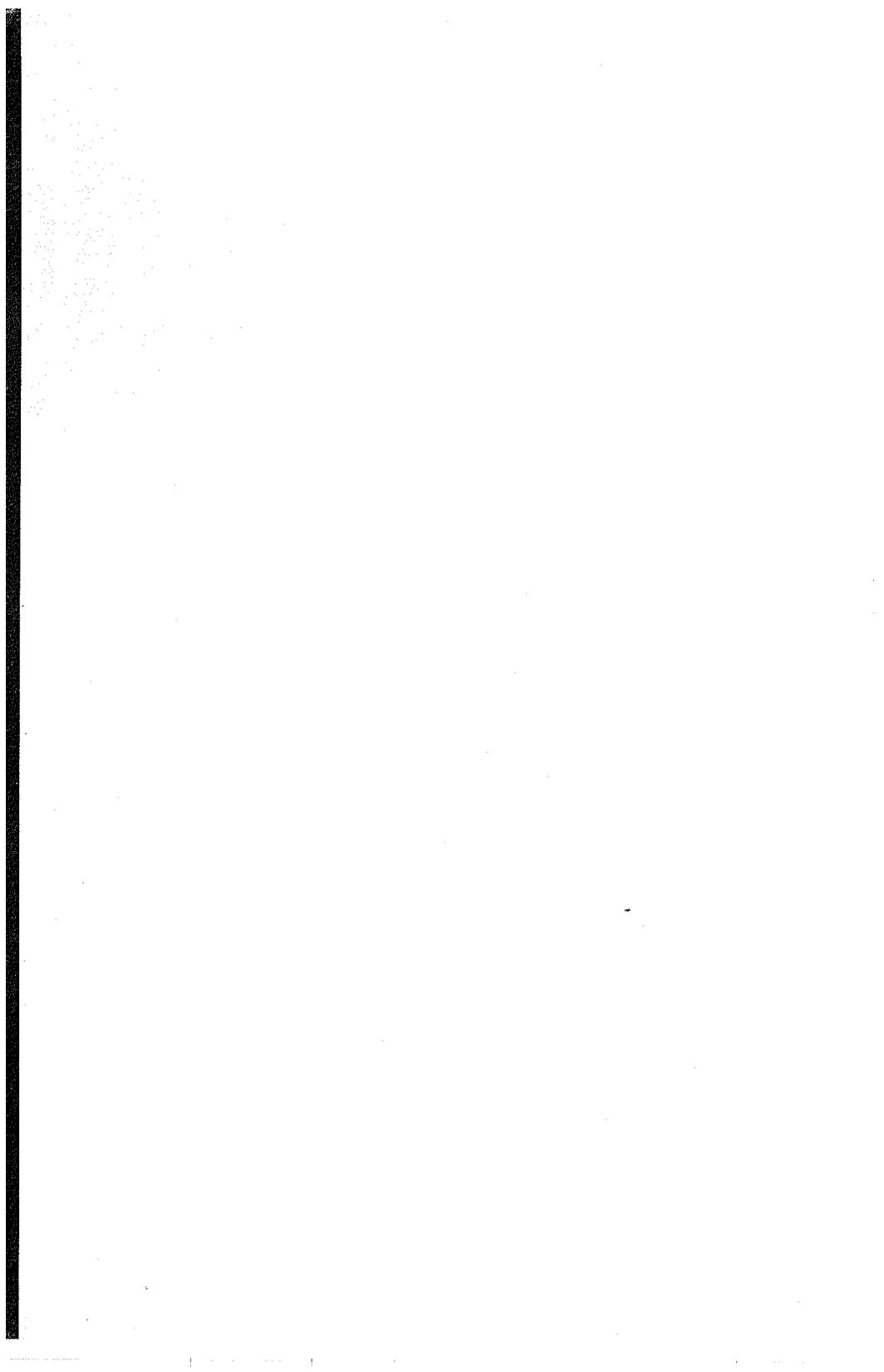


Richard A. Coffey

# **The Skylane Pilot's Companion**

by Richard A. Coffey

**Sunset Hill Publications  
Sandstone, Minnesota**



For Clarence Hines, the man who taught me how to fly, and  
for Jeanne, who saw to it that I flew. This book is dedicated  
to the memory of Jim Tompkins, my mentor and teacher to  
many of this country's pilots.

Many people have made this book possible: my students, my teachers, my friends who fly and whose lives have changed because they have flown. My wife, Jeanne, read this book as I wrote it, page by page, chapter by chapter. Dave Moran, Darrell Bolduc, Anders Christenson, Don Huseeth, Jim Erickson, John Strand, Dale Pancake, Steve Ells at Cessna Pilot's Association and Paul Bertorelli, editor of *IFR* and *Aviation Consumer*, all read the book in an early form and encouraged me to continue. Artist Cliff Letty spent a few hours with my Skylane and listened to my stories and then disappeared for a couple of weeks, returning with the cover art. Finally, my trusted and talented friend, Micky Christensen, edited the book and watched over the production to the end.

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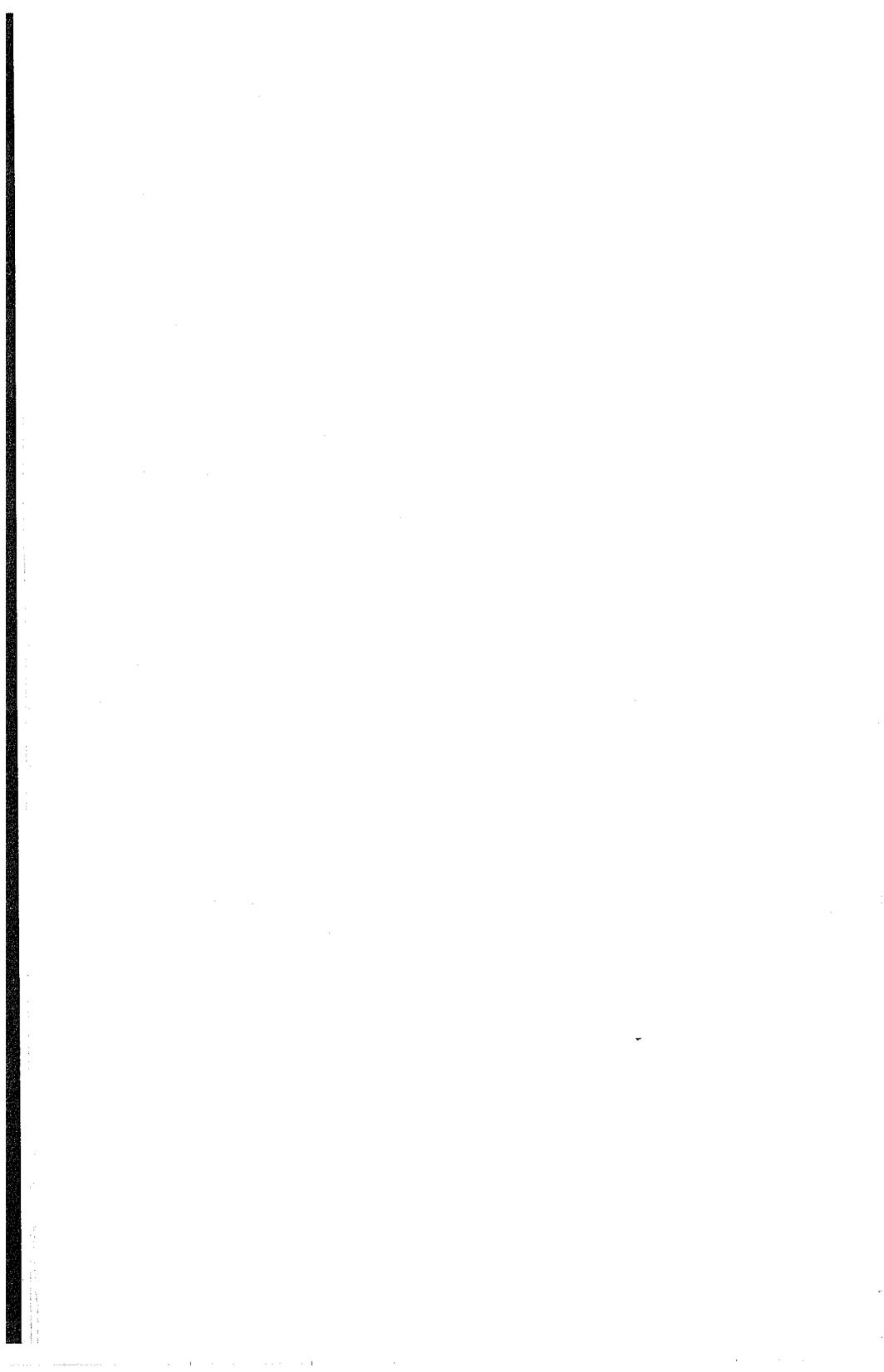
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“No, my friend, I have not learned more than this. Nor in all these years have I met many who have learned as much.”

— Beryl Markham, *West With the Night*



# Prologue

The sky ahead is deep blue, nearly black with rain. The sun, which is at my back, has created a large rainbow ahead, and should the illusion of this divine portal persist, I will soon fly under the golden archway, my airplane illuminated like a small, red, white and blue heavenly projectile.

My engine produces a steady drone, a bass cello tone, a long single draw of the bow across the low note. The song varies slightly from time to time as the nose of the airplane pitches up or down on the waves of the wind produced by the storm ahead. My hands ride loose upon the control wheel so I can feel the rhythm of this atmospheric sea, so I, like the sailor, can feel my ship and guide it through the gale.

I came to the sky as a pilot more than 20 years ago, and I found peace and beauty and numbing silence here. At times I have come to the sky to be alone, to climb high above the earth on a moonlit night in winter; I have come to fly among the clouds where my mind could peacefully untangle the complications of some earthly enterprise, and I have come to the sky with Jeanne, my wife, my lover, to explore our remarkable country together. I have come to the sky in pursuit of business, running hard against the clock, and I have come to the sky as a flight instructor, help-

ing others to discover the beauty of flight. I have been terribly frightened by what I have found in the sky, and I have laughed out loud here at the joy of discovering some new resource in myself. Of the half century that I have lived, nearly one full year has been spent in the cockpit of an airplane, high in the sky, taking pleasure in the gift of wings.

I have secured much of the paraphernalia that rides in my airplane with me today. The books of charts, the flashlights, a camera and a small portable radio are stowed under the belt of the empty seat to my right. I have secured an opened can of cold Coke between my legs where the chill and the wet surprise me, and over my ears there is clamped a headset from which a microphone stalk protrudes and rides at the corner of my mouth.

Other airplanes flying near this storm are receiving vectors to the right, and the controller has approved my request for a similar turn away from the dark center of the cloud ahead. The rain has come now, thrashing against the plastic windshield, running upward in small nervous rivers, and the turbulence has come too, at once lifting me a few hundred feet and then dropping me as an angry child might drop a toy that only a moment before he found fascinating.

I have flown into a gray fog, the cloud at the edge of the storm, and my eyes drop to the instrument panel and focus on three gyroscopic gauges that inform me that my wings are level, that my heading is  $110^\circ$  and that the forces of yaw and pitch and roll are in balance. I scan my altitude and airspeed, which are varying according to the whims of the updrafts and downdrafts of the storm. I lick my lips, which have become dry, and my tongue brushes the microphone at the corner of my mouth.

“Minneapolis Center, 3135Q, request,” I say quietly as if my words were an afterthought to a breath.

“Go ahead 35Q.”

“Yeah, 35Q would like to take another turn to the right —

fifteen degrees if that works for you.”

A brilliant flash of lightening illuminates the instrument panel, and I close my eyes for a moment.

“Roger, 35Q, turn right heading one-three-zero degrees; and how’s your ride?”

“One-three-zero and 35Q’s in and out of moderate turbulence.”

“Roger.”

I imagine my controller dressed in Dockers and a bright summer shirt, sitting in a darkened radar room in the Federal Aviation Administration’s low, flat-roofed building in Farmington, Minnesota, 120 miles south of my present position. He takes a drink of coffee from a Styrofoam cup without taking his eyes from the radar screen. With his free hand he writes: ‘1834Z: Cessna 182/moderate turb.’ I take a sip of Coke, which has become warm, and I wipe the moisture from the can on my pants. I look up and see that I am still in cloud as I roll out on my new heading, and then my eyes return to the instruments.

The bow draws slowly across the cello’s low note and the turbulence subsides. I draw a quick breath and force my shoulders to relax. The cockpit brightens; the rivers of rain that have been ascending my windshield have become quiet, meandering streams, and in a flash I am propelled out of the cloud into a bright summer’s afternoon, high above Mille Lacs Lake.

The earth below me appears to be a rich, green carpet festooned with blue-patch lakes. It is a world without inhabitants; it has become a familiar view these past 20 years, and yet I know what I see is an airman’s illusion for there are signs of human activity from these 9,000 feet. There are lines that I know to be roads and there are clearings that I know to be resorts along the south shore of Mille Lacs Lake. The architecture of civilization that I can see looks pure and clean and reasonable, as an ant hill appears reasonable to the hiker. And I am of that civilization that

lies scattered upon the carpet below, and I know its truths, its terrible cruelties, its beauty and its beliefs. Even as I contemplate this terrible and beautiful weave of cloth from nearly two miles above, I smile warmly, because I make my home in its fabric.

Flying is not natural to humans. It's a bit of art and a bit of science. Flying an airplane is not the same as using one's evolved musculature and cunning to climb a mountain of rock; it doesn't call on strength at all. Flying is, rather, an intellectual pursuit in which strict physical laws and sophisticated engineering principles combine to produce a machine that can defeat gravity. There is no magic, no genetic ancestry, no superhuman attribute that makes a flyer of a man or a woman. I am able to pass by, as a cloud on the wind, two miles above my earth only because I have learned how to control and manage the physics and the engineering of 2,800 pounds of aluminum and steel, rubber and plastic. I pass by above my earth at 150 mph and remain aloft for four hours by managing the flow of 360 pounds of fossil fuel. I am able to fly because thousands of my kind have flown before me and left me with their instruction. I fly, not free like a bird, not on high upon a zephyr of wind, but I fly above the common day using my brain.

It takes no great courage to fly an airplane, nor any great strength or resolve; flying an airplane is simply a matter of choice, a matter of purpose. Flying is a skill that is learned and practiced as one might practice the cello, searching always for the better performance. Good flyers come to believe in themselves, come to believe in the individual as the progenitor of fate. I know of no pilot who believes in magic, nor who believes that human activity is guided by spirits any more than he or she might believe that thunder is the voice of God. Yet I know few pilots who do not believe in God.

The airplane is a gift of science.

Yet, I am no scientist. I am a man of romance.

Several hours ago I approached my airplane as it stood, tied fast to an airport ramp. I loaded my briefcase and several boxes into its cargo hold and I began a preflight inspection, a checkup of sorts, a light physical exam that informs me about the condition of my airplane. I come to know the airplane when I pass my hand over the airframe and inspect the engine for incongruities. I tug at the control surfaces to see that they are firmly attached, and I look after the quantities of oil and fuel. This preflight is conducted to assure that the airplane is safe to fly, but it is also a process of becoming a pilot. Like the stage actor who assumes the role of a character and whispers the lines in the wings of the theater, I become a pilot by thinking through the coming flight, by approaching the airplane as if it were a horse made nervous by the sight of a saddle. Though I may have come to the airport from a business meeting or from my bed on a warm summer's morning, I have been taught to steel myself against an attitude of careless regard for the condition of the airplane. I have been taught to take time to consciously plan my flight by measuring a course across the earth, by computing the burn of fuel and by gathering and interpreting what weather is known. And when I am satisfied that the flight is possible, and when I have weighed the difficulties of a journey against my abilities and experience, it is then that I approach the airplane, in character, prepared and inspired to fly.

In this way the scientist and the romantic, the woman in business and the man of labor, the son and the daughter all come to their airplanes as one, as pilots. And the aircraft they fly, the flivers and the flibs, the small jets and the transports, the helicopters and gliders and balloons, are too all of a kind: tools, simply put; tools designed to defeat gravity.

The pilot is no more than the manager of this tool, and its champion. The pilot is the inspiration for flight and the airplane is the vehicle. Alone they are but a man or a woman and a con-

struct of metals and wires and plastics and fabrics. It is only when the one is intelligent and the other is in readiness that flight becomes possible.

And when they come together, the intellect and the tool, there comes a third thing, a discovery of sorts, a disclosure, an event that is neither of the man nor of the machine: flight.

Flight is the business of birds and insects, the labor of the goose, the survival of the hawk. Flight is a modest enterprise of man.

Far below me just now there are small cumulus clouds forming, and they bear watching. The warm air of this summer's morning has risen, carrying with it moisture from the damp fields below. The warm, moist air rises and cools and condenses and collects upon minute particles that drift about in the atmosphere, and a cloud forms. If there is sufficient moisture and strength in the rising warm air, the few cumulus will be joined by others, spoiling the bright summer's day for those who live on the ground and inviting trouble for the pilot who flies by reference to the earth's horizon. If I were to reduce the power of my engine and let the airplane sink down to the level of these low clouds, I would feel the bumps of the rising, disturbed air. Pilots call the rising air thermal convection, and they avoid flying in it because it is tiresome to do so and because their passengers would find such bumps uncomfortable. If there is a good deal of moisture in the warm air, the small cumulus clouds grow fat and tall and produce even more heat. This heat, in turn, rises, building a tall cloud that develops even more energy, and a thunderstorm is born.

When I look behind me at the cloud from which I have just flown, I see a deep blue shaft of rain in the center of heaps of congested cumulus. The whole of the storm is quite small from the air — about five miles in diameter — and it is moving toward

the northeast about 25 mph. I must crane my neck to see the top of the storm, but it probably towers 35,000 feet, and that's average as thunderstorms go at this latitude. If there is enough heat and moisture in the path of this storm, the cloud may reach 45,000 feet by afternoon, and that's a tough storm that may drop a lot of very cold rain and even hail.

A thunderstorm is an efficient atmospheric factory that uses a small amount of energy to produce a great amount of heat. When the heat is cooled and the moisture condensed, small droplets are cycled in the cloud until they grow in size and become too heavy to rise again. They then fall to the earth as rain, often riding on a downburst of wind.

A thunderstorm is a bit like a large vacuum cleaner that pulls warm, moist air filled with dust and dirt from the earth and lifts it high into the cloud. There the air is washed and cooled and returned to earth as wind and water.

The pilot sees all of this from the airplane, and he watches a thunderstorm carefully, admiring its beauty and power but keeping a safe distance, as one might admire the beauty and the power of a jungle cat — from some distance.

Again, I am conscious of the long, low note of the cello as my engine pulls me along at 150 mph in smooth air at 9,000 feet. If you were below me just now, you might not hear me, say if you were mowing the lawn or concentrating on the weeds in your garden. If you were sunning in the fresh green grass of your lawn, alone and without distraction, you might hear a faint whine above, and you might shade your eyes and look for me above the scattered clouds.

Many years before I flew an airplane, and while I was disengaged in the summer pursuits of a ten-year-old, I lay in the tall grass in the pasture behind our country house and watched, with

binoculars, for the airplanes that were landing at the Rochester Airport.

We lived on a hill several miles from the airport, which afforded me a close view of the undersides of the DC-3s and 4s that lumbered into the traffic pattern, dropping their huge wheels, throttling back their powerful engines and gliding out of view. Often, moments after the airplane's passing, I would see a red-tailed hawk circling, soaring in the warm, rising summer air, its wings catching the wind. A brighter child would have studied the wing, the wind and the rising bubbles of warm air that supported the hawk. I was satisfied to wonder, to imagine, to close my eyes and rise into the summer's sky and soar upon a gift of wings. I believed that I could, and on one hot day as I lay deep in the grass and the wind came, and my hawks rose into the deep blue, I suffered a case of vertigo that produced for me the illusion that it was I who was tumbling and spinning, face-down and falling into the sky. I was frightened and I held fast to handfuls of tall grasses and closed my eyes, but the picture was clear: I was flying. I was turning ever so slowly far above my field, supported by outstretched arms which, I was surprised to see, were covered by neat rows of feathers. My fingers controlled long primaries, which, when I flexed them, turned me to the left and to the right.

I rose from the pasture, stunned, and I walked home in the euphoric afterglow reserved for ten-year-olds. I wanted to fly.

Sometime later that summer, while I was prowling about the airport, a pilot of a small airplane offered me a ride. We climbed into the sky in a silver Cessna 170, and as we circled above my pasture, I knew that my illusion had been faithful to fact. We did indeed turn on our wings, and when we dived the wind whispered, hissing, and there was a hush when we climbed. And our small Cessna was but a whine to the farmer in the fields below, and if he had looked up, which I doubt, he would have witnessed the moment that I resolved that I would become a pilot.

But it was a summer of many resolutions. I had also resolved to become a photographer, a geologist, an archeologist, a master detective, a premier philatelist and a stock car driver.

Still, at night, as I lay in my bed in the house on the hill, I waited for the sound of the DC-3s, and as they passed and throttled down, I thought I could hear the wind on their wings.

I pull the throttle back and the soft, bass note of the cello fades; the airplane descends. Minneapolis Center has cleared me for a visual approach to the Sandstone Airport, at pilot's discretion to 3,000 feet. I check the altimeter. Eight thousand seven hundred feet. The vertical speed indicator reports that I am descending at 500 fpm and the directional gyro is pointing to a course just a bit south of an easterly course. Beyond the Plexiglas windshield my world is blue sky streaked by rows of stratocumulus above and a brilliant white field of cumulus below. I will sink, at 500 fpm, on course, through the clouds below me and, after a two-minute descent through the cumulus, I will see fragments of the rich, green earth below. A moment later I will be descending beneath the clouds with the Sandstone Airport in view.

My descent is smooth, and it will remain smooth until I am a few feet above the clouds, when I will drop into the bumpy convective layer. Just before I drop into that choppy air, I will raise the nose of the airplane a few degrees, which will bleed off some airspeed, and I will further reduce the power to keep my descent at 500 fpm. I slow my airplane down for the bumps, just as I slow down my car when the road gets rough. The ride will be smoother and the airplane won't be buffeted around so much. The airplane's weight increases momentarily when it lurches up in turbulent air, the way our weight increases for a moment when an elevator rises rapidly, and the extra load stresses the airframe. When we are traveling over the ground at 150 mph, we can afford

a little extra time to be gentle. Just now I am about to sink into the clouds; already wisps of gray fog streak by my windshield. My eyes return to the instrument panel where a gyro-operated attitude indicator replaces the natural horizon. I will scan all my instruments quickly but calmly to maintain the airplane's descent, airspeed and attitude during these few minutes in the clouds. The once-bright cockpit is darker now as I sink deeper and deeper into the cumulus, and small rivers of moisture wiggle up the windshield. I remove my dark glasses. I touch the control wheel and apply just a little correction to the right to maintain my heading and a little back pressure to keep my airspeed at 130 mph. The bumps have begun in earnest now and a flashlight on the floor rolls slowly back and forth. My head bobs from side to side, touching the window on my left. With my forefinger I bring the control wheel back another inch, which lifts the nose another few degrees, and my airspeed decreases to 110 mph. I pull the throttle back less than an inch to maintain my descent of 500 fpm.

Just as suddenly as I dropped into the clouds, I seem to rush out of the base of the stratocumulus layer. It's relatively dark on the earth below me, and my eyes take a moment to adjust to the dull light. I call Minneapolis Center and report the Sandstone Airport in sight. I tell my controller that I can cancel my IFR flight plan.

"Cessna 3135Q, roger, squawk VFR, frequency change approved, and have a good day."

"35Q, one-two-zero-zero, and thanks for your help," I reply, changing my transponder code and switching to a transmitting frequency of 122.9. Then I announce my arrival:

"Sandstone traffic, Skylane 3135Q is ten miles north and we'll be entering left traffic for runway three-five, Sandstone."

I make the call in the blind, to be received by any airplanes that might be in the vicinity of Sandstone. In Minnesota alone

there are 130 airports serving small towns like Sandstone, and air traffic is managed by the pilots who use the fields. I scan the gray, leaden skies for airplanes as I make the call.

The airplane descends and I am aggressively scanning, looking for other airplanes. My hands make power reductions and attitude changes and I announce that I am five miles north, entering a left downwind for runway 35. I apply back pressure on the control wheel and the airspeed needle winds down from 120 mph to 80. The rising, warm summer air is choppy and the flashlight is rolling wildly on the floor. If I had passengers aboard, I would turn in my seat and smile and ask if they would tighten their seat belts. I would check the doors to be sure they were secure, and I would smile again and announce that we were about to land. Again I would raise the airplane's nose a few degrees, slowing our speed through the air and increasing our descent. I throttle back again, and I lower a few degrees of flaps.

The long, low note of the cello fades into the sound of rushing wind and the airplane descends. The wheels touch the asphalt runway; the wings, moving too slowly now to produce lift, relax and flex in response to the cracks and bumps of the asphalt. The gift of lift is spent and, like a duck out of water, the airplane is awkward on the ground, a curiously shaped invention, without grace, without purpose.

And this particular airplane, a 1967 Cessna Skylane, is especially without grace. A few months after Virg Grissom, Ed White and Roger Chafee died in the Apollo I fire, in a year when the United States had already lost 5,000 kids in Vietnam, the year that President Lyndon Johnson launched his 'Great Society,' my airplane, N3135Q, rolled off the production line in Wichita, Kansas, and was sold to the Montana Forest Service. 3135Q had been outfitted with a couple of Narco Mark 12 radios, an ungraceful-looking set of large tires, and a heavy-duty nosegear that could take a pounding on backwoods airfields.

I came to this airplane 20 years later, long after the last cheer for the U.S. space program, long after the usefulness of the Great Society, and so long after Vietnam that the sons and daughters of the veterans studied the war in high school textbooks.

35Q was an aging actress when I saw her first, and I was cautioned to keep my distance unless I was made of money. But I fell in love with the old bitch dressed in her shabby orange and black paint and putrid, stained cowling from years of smoking rivets and spilled gas.

Though I had flown for some years, I had the peculiar feeling that this airplane had something to teach. I would soon discover that it was I who had much to learn, and 3135Q would become the classroom.

# Chapter One

The skies were gray, low and leaden, and there was a fresh west wind too, making me glad I had worn my leather jacket. "At least I did one thing right today," I mumbled as I plodded across the field to the farmhouse. I stopped and looked back at my airplane, which was tipped a bit to the right, strut-deep in the alfalfa field where I had landed her when the engine quit. For the first time in 20 years I wanted a cigarette.

I looked at my watch. Fifteen minutes earlier I had flown over this farm at 5,000 feet above sea level, eastbound, high above the low, ragged clouds. Flying in the sunshine nearly a mile above the gray autumn day on earth, I was heading for a Saturday gathering of pilots in Wisconsin, slouched in my pilot's seat, finishing a Coke, tuning in a new frequency, checking in with Minneapolis Center, when the engine coughed.

I put the Coke can between my knees and tried to focus my attention on the engine instruments. Oil pressure was okay; temperature, okay; fuel, okay. Both tanks were full of gas. I pulled the carburetor heat on and the rpm decreased, as it should. I pushed the heat control in. The O-470 Continental engine ran smoothly. I relaxed.

Engines are not supposed to cough, but when they do, we

pilots sit up straight in our seats and try to think clearly. We try to think about why the engine faltered. It's difficult to concentrate because there are other considerations. We ask, "If the engine quits now, where will I land?" We think, "Why is this happening? They just worked on my airplane." We remember simple truths about combustion, and we remember the experiences of others.

"Must have been a little water." And then, having said something on the subject, I relaxed, a little. I sat a bit taller in my seat, but I relaxed and watched the instruments. I could feel the tension draining away as the engine continued to run well, and soon I was slouched again, talking on the radio, looking at a chart that would lead me to the runway in Wisconsin. I had just finished my Coke and was preparing to begin my descent when the engine coughed once, then barked loudly, and barked again and again in a concert of small explosions, each followed by a shudder that went through the airplane as if I were being struck from behind. The vibration was shaking the engine, and, as I was moving forward in my seat, trying to understand why my manifold pressure was increasing and why there was so much vibration, the engine quit.

The silence of a failed engine is deafening. The pilot's mind is numbed. I was thinking, "This isn't happening; it's not supposed to be this quiet in the airplane." And while my sluggish mind was lamenting the absence of power, my hands moved quickly from the fuel selector to the carburetor heat to the throttle to the prop control to the mixture, the magnetos, the primer and back to the control wheel. I was performing the emergency drill, as I was trained to do, but I couldn't grasp what was happening.

The engine started, and then it quit again. I eased the control wheel back to reach 80 mph — the best speed to glide. I happened to be flying over a small break in the clouds, and I saw the

ground, a mat of brown earth splashed with autumn-orange tamarack trees. I called Center and told them I was VFR and canceling my instrument flight plan. It was a stupid thing to do — to cut off a helping hand — but I felt like a sailor who had suddenly fallen overboard and was thrashing in a very cold sea. I wanted to clear away the debris. I wanted to be free of distractions and descend beneath the clouds where I could find a smooth place to land the Skylane.

It's funny how a pilot wants to hurry to the earth when something goes wrong; it's the last place he should want to go until the airplane is settled down and ready to land. On the descent I refused to believe that I had a very serious problem. I was concerned only to fly through the hole, get level beneath the clouds and, if my navigation had been correct, land at a small bogland airport that was five miles to the south.

When I broke out under the clouds the visibility was very good, revealing miles and miles of uninterrupted backcountry, bog and swamp. No place to land. I pointed the Skylane south and I saw the airport about three miles ahead. I was finishing my emergency checklist and had switched the engine magnetos from 'both' to 'right' when the engine caught. My hand froze on the ignition key. My mind was still muddy, but I said, "All right! We're flying!" The engine ran on the right magneto.

I leveled the airplane 500 feet above the ground and scanned the instrument panel and the engine controls. Things didn't look normal. The carburetor heat was on full, the throttle was nearly full forward and the prop control was pushed to the wall. I had low oil pressure and the temperature was high. I felt sick. "This is going to be expensive," I said.

But the Skylane's engine was running. I was now only two miles from the airport. I looked at the chart. I was only 20 miles from homebase. I could turn to the west and fly to my home airport in 10 minutes. In 10 minutes I'd be home. In 10 minutes I

would pull the airplane into a hangar and my own mechanic would remove the cowling and tell me that my problem wasn't as expensive as I had imagined. In 10 minutes I would be a lot happier at home than I would be if I plopped down at a strange airport where I would have to arrange transportation and storage for 3135Q. The engine was running, and I was prepared to limp along if it meant that I could get the airplane home. I turned west, and I knew as I turned it was the wrong thing to do.

Five miles short of homebase the Continental coughed with a bang and began to vibrate so badly I couldn't read the instruments. I pulled the throttle back, switched mags again, and looked overboard at the forest passing 800 feet below. Ahead there seemed a clearing, a small postage stamp of a field. I aimed the Skylane for the field. I looked for rocks and trees and fenceposts as I flew a few hundred feet above the field, and then as I turned above a farmer who was passing below on his tractor, my engine backfiring and vibrating, I thought, "I'm going to be walking down there in a few minutes. This isn't happening ..."

I landed smoothly, shutting down the engine as I rolled. The Skylane's gear chattered as the airplane lurched in and out of holes and bumped over rocks. The tall alfalfa slowed the ground roll. Then it was quiet. I could hear crows cawing and the tractor in the next field. I sat in my seat for a moment and listened to the gyros wind down.

I left the Skylane and walked toward the tractor with the cold October wind at my back, thankful that I had worn my warm leather jacket.

So far it was the only thing I had done right.

The farmer's family thought it good fun to have an airplane on their place. I argued against letting the cattle browse the alfalfa in the field, for I'd seen cattle scratch themselves on fenceposts that teetered against their weight. An airplane wouldn't

stand a chance of surviving a relationship with a 1,200-pound Guernsey.

I sat for two days against the warm, fat tires of N3135Q, watching the geese fly south and watching for the clouds of snow to come, while the mechanic muttered and swore and stripped away engine parts in search of the flaw. In between tours of the 'crashed airplane,' the farmer and his family prepared their fields for winter. They passed by, waving, and I waved in return, smiling as broadly as I could manage for someone who had just parked 2,800 pounds of aluminum in a feedlot. I watched the mechanic work, I paced off the field in preparation for the flight out, and I lay in the autumn sun, penitent and confused as my emergency landing performance replayed itself over and over in my mind. It occurred to me slowly, one small revelation at a time, that there was a connection between my bad judgment, my helter-skelter arrival in the alfalfa and the failure of my engine. I couldn't imagine that I was a bad pilot. With nearly 2,000 hours in my logbook and 800 of those in Skylanes, I'd felt I was getting the hang of piloting an airplane. I was confident in my instrument skills, I felt comfortable flying at night in and out of small strips, and I was flying 400 hours a year, most of them on business in the Upper Midwest.

I was enrolled in a flight instructor course. I had come to the point in my flying life where I thought it would be good fun to teach people to fly. Flying had enriched my life, and I wanted to spread the gospel. During my coursework for the certified flight instructor rating, I realized that I knew very little about aerodynamics, meteorology, aircraft systems and the regulatory aspects of flying. I found myself absorbed in studying how the great variety of wing shapes produce lift and create drag. I began to see the surfaces of an airplane as dynamic and, for the first time in 15 years of flying, I began to care how an airplane flew. I began to understand how the atmosphere produced weather, and I began to

understand how the *Federal Aviation Regulations* evolved as a kind of airman's bible, written in blood. I was only beginning to understand how little I really knew about flying airplanes. Experienced and proficient pilots knew their aircraft in a way that I did not. I hadn't learned how to respect an airplane.

Always looking for a way to beat the high cost of flying, I was pleased that my shop could maintain my Skylane for less than \$500 a year. The boys had rebuilt my magnetos themselves, just as they had scavenged parts for the failing induction system and cleaned up the carburetor, which was in need of more serious attention. We patched and pasted and taped things that should have been replaced. I burned car gas on the strength of an STC that had come with the airplane, and I got used to dripping oil as a byproduct of the O-470 Continental engine. 3135Q was a mess, as airplanes go, and the new paint and the King avionics did little to redeem its poor health.

I waited for the hour when the mechanic would pull his tools away from the airplane and tell me I could start the engine and fly 35Q off the farm. The plan was to fly five short miles to our home airport, put 35Q in the shop and find out why the engine had failed. The mechanic's objective was to produce an airworthy airplane in the alfalfa field, while I worked the takeoff numbers and prepared to fly 35Q out.

On the morning of the third day the mechanic announced that he had installed overhauled magnetos on 35Q, she ran well, and we were ready to go. I paced off a departure path through the alfalfa for the fourth or fifth time and found that I had about 600 feet of suitable runway. Beyond the alfalfa there was a fence, and beyond the fence there was some low and wet terrain with trees. I checked the Skylane manual and found that at a gross weight of 2,000 pounds I could expect to clear a 50-foot obstacle after a ground run of 460 feet. The winds were gusty but averaged about 10 kts right on the nose. The air temperature was 40°F. The field

conditions were dry, and on the far south side of the field the alfalfa had been grazed by the cattle recently and was short. I added seven percent to the ground run for grass and 10 percent for the warmer temperature. The book suggested that I would need 540 feet of ground run to clear a 50-foot obstacle.

We unloaded about 100 pounds of junk that I had been ferrying around in the airplane, stuck the fuel tanks, which showed about half full, and I taxied to the end of the field. The mechanic had wandered down to the opposite end of the field where he could watch my departure, and when I looked for him, I could only see the top of his cap, which meant that I had a rising grade on the first few hundred feet of the departure run. I used 20° of flaps, powered up, and the Skylane climbed nicely after a bumpy 300-foot ground run. I cleared the trees, pushed the nose down and, as the airspeed rose, brought the flaps up.

Then the engine began to cough and sputter. I pulled the carburetor heat on and aimed for the airport, where I landed three minutes later.

It turned out that the magnetos had both failed on my trip to Wisconsin — first the left and, presumably because of the vibration, the right mag chucked it when its rotor fell apart. The engine vibration caused by the self-destructing magnetos had wreaked havoc with the induction system. There was damage everywhere. The air intake box had warped; pieces of the intake manifold had to be replaced; parts of the exhaust system had broken from the mounts. It was clear that if I had asked Center for a vector to the nearest airport after the engine's first guttural cough and had landed, I would have saved several thousand dollars of engine damage.

What bothered me more than the size of the checks that I was writing to the FBO was that I had performed very poorly as a pilot. With every check for every part that I replaced in the airplane, I was reminded that I had a sizable deficit in my bank of

pilot skills. My confidence was draining away as fast as my savings account, and I didn't know what to do about it.

While 3135Q was scattered in many pieces on the shop floor, I attended flight instructor school. My instructor, Dave Moran, was a professional pilot and a veteran instructor. Dave only looked at me with a smile after I had told him about my 'emergency' landing. After I was finished with my story and quiet for a moment, Dave sat up in his chair, opened the textbook and said, "Good. Now that I have your undivided attention, let's talk about aircraft systems."

For the next two months I studied as I have never studied before. It became an obsession with me to understand why I had failed to do the right things in the correct order when the engine gave me its first warning. How does a pilot react to an engine that coughs? The pilot makes a decision based on his knowledge and experience, Dave said. What makes an engine cough? To know that, the pilot needs to know what an engine does when it's not coughing. Dave mixed air and fuel and put this vaporous mixture into a cylinder for me. My homework assignment was to report the following day on ways to turn this potential energy into power. Dave pushed air over an airfoil and I described lift. Dave loaded a control surface with force and I unloaded the surface and explained the relationship of load factor to airspeed by drawing a V/G diagram on the blackboard, once, twice and again for any passerby whom Dave called into the room.

We explored the weather along stationary fronts by learning how an air mass is born and identified and reported and modified as it begins to move across the earth's surface. We pushed cold air and warm air together and watched the warm air rise and cool and condense and rain into the cold air below, falling as snow, light and pretty as it was one day when I stopped by the airport to look in on 3135Q.

I arrived late. The mechanic had gone home. I turned the shop lights on and walked around my Skylane for a few minutes, poking at the scattered pieces of my induction system, tapping on valve covers, pinching the skin on the horizontal stabilizer. I climbed in and sat in the seat where I had last flown nearly two months before. There was something strangely changed about the airplane, as it seems when you meet a young person whom you last saw as a child. When I pulled the elevator control back just a bit, I could feel the cable running beneath my feet, across the pulleys to the elevator. And when I looked over my shoulder at the elevator rising, I felt, for just a moment, the nose pitch up and the weight of the airplane move forward on the wing. Just there, on that wintry afternoon, alone in the hangar in the silence of a December snow, I knew that after 15 years of flying, I was finally going to become a pilot, and my Skylane was going to teach me to fly.

My leather jacket was stuffed into 35Q's baggage compartment and I removed it, shook it once and dropped it on the floor. I bought a Coke and sat on my jacket, cross-legged, in awe of N3135Q. For the first time in four years I really looked at my airplane. There, as the cold wind blew eddies of snow under the hangar door, I studied the bulbous form of my 182 like a small child might look at his first teacher, full of wonder and respect and curiosity. I wanted to know about this winged apparition more than I wanted anything in my life. I felt then, and I know now, that coming to know this assemblage of aluminum and steel and plastic and cloth would be a door, which, when I opened it, would give me flying pleasures I'd never experienced before and also teach me something important about myself.

## Chapter Two

It was a cold and windy day in March when Jeanne and I first saw 3135Q. That year I'd been looking for a Cessna Cardinal, and one day a friend called to tell me about a couple of 177s he'd found in Minneapolis. "Good, clean, mid-time airplanes," he said. "I'll arrange for you to see them — and while you're down, I want you to have a look at an older Skylane that just came up for sale."

I really hadn't given much thought to Skylanes. The models that I had flown seemed like big, noisy, fuel-guzzling Cessna 172s. They even looked like 172s to me, and after 15 years of flying 150s and Skyhawks I was in hot pursuit of a Cessna that didn't look like a Cessna. The Cardinal was a racy-looking airplane. I had convinced Jeanne that after buying a Cardinal we would find ourselves on the ramp to the fast lane, that we could fly on a 172 budget, faster in a better-looking machine. I had convinced myself that the Cardinal would be an excellent platform for my aerial photography. What I really liked, however, was the low-slung sports car appearance of the Cardinal and the feel of sitting forward of the wing. I imagined that Jeanne and I would soon be flying a pretty, plush-leather 177 with a full stack of new radios and overhauled avionics.

My friend gave me the keys to three hangars and we started down the line. The Skylane happened to be in the first hangar and we stopped there, expecting to peek in and walk on. When we opened the hangar door that cold day and stepped in out of the wind, Jeanne said, "Ohhh! That's our airplane!"

I still don't know what it is that makes pilots feel warm all over when they see the right airplane for the first time, but I felt very warm. 3135Q was a tired-looking 1967 model, dressed in fading red and black paint. The tires were oversize, and there was a stream of red dye on the fuselage, aft of the door — aft of both doors as it turned out. There was a small puddle of oil on the floor just behind the nosewheel and the windshield was gray and streaked with something gunky. There wasn't much hangar rash, but all of the Royalite wing caps and strut fairings were cracked. The airplane's interior was lustless red nylon that was remarkably clean for a 20-year-old airplane. The panel was laid out in the pre-1968 chaos of all Cessnas, and the radios were old Narco Mark 12s. There was a Narco ADF-31, a KMA-12B audio panel, and an ancient King transponder. "I love it," Jeanne said, sitting next to me. She reached out and touched the panel, wiping a little dust from the faded glareshield. I pulled my chair forward until I could reach the rudder pedals. I pulled on the control column and was amazed that the elevator was so heavy. "It's really a big airplane," I mumbled. But Jeanne was looking in the back seat. "Look at all that room!" She got up and stepped between the seats and sat in the back, stretched out, smiling.

"It's like a '67 Impala," Jeanne said.

I smiled. "I think this airplane is going to take some serious rehab," I said, tapping the magnetic compass that had run dry of kerosene.

"So? Who cares?" Jeanne said. "We'll make it ours. If it runs we can fly it and restore it as we go along. I'd rather fly in something that is really us than a factory-leather job anyway. I feel

good about this — it's so big inside. You're going to fly it though — it's your decision."

I played with the control wheel for a few minutes and then reached across the panel and tuned in a transponder frequency. I liked the 'feel'; I loved the space. I was really pleased that Jeanne had an affection for it. We could suffer a lot of expense down the road if we both loved the airplane.

"Let's go talk to Bob," I said. "Want to look at the Cardinals?"

"Not me," Jeanne said, laughing. "I've found my airplane." We walked back to the office already planning our first trip to Arizona. While Jeanne looked at pictures taken by the former owner, I looked over the logs with Bob.

N3135Q was born on April 12, 1967, outfitted with Cessna's optional heavy-duty landing gear at the factory and sold to the Montana Forest Service, where it lived and worked until 1969 when Montana sold it to a rancher in Dickinson, North Dakota. After a few years and one 'landing incident,' the airplane was sold to a Minnesota partnership. The airplane had 3,000 hours on the airframe, 600 on a major overhaul and approval for auto fuel, which apparently was leaking out of relatively new fuel bladders. During the last few years 35Q hadn't been flown much and, although annual inspections and routine maintenance had been done by reputable shops and the Airworthiness Directives had been signed off, the logbooks reflected past owners who were satisfied to comply and fly. The restoration of 35Q would begin with us.

Several days later I walked into the hangar with Darrell Bolduc, owner of Bolduc Aviation, a well-known Midwest engine overhaul shop. I'd asked Darrell to do a pre-purchase inspection. Twenty feet from the airplane Darrell looked at me and wrinkled his nose. "Oh, boy," he said. "Have you looked at anything else? There have got to be better Skylanes around."

"Jeanne likes it," I said.

“Oh. Well, let’s have a look at it,” Darrell said.

An hour later Darrell had put together three pages of real problems and an additional two pages of probable trouble. “It’s not in the best shape,” Darrell said. “I think you’re going to be money ahead holding out for a later model, a little lower total time with an engine that’s been flown recently — look.” Darrell put his finger inside the exhaust stack and pulled out a load of black gunk. “It’s been running way too rich,” Darrell said. He pointed to the puddle of oil on the floor. “I don’t think it’s coming from the breather.” The engine baffling was frayed and torn; there was oil everywhere. The carburetor was leaking; the air filter looked like it hadn’t been replaced for a few years. “It’s going to be expensive,” Darrell said.

I saw Darrell out and returned to the hangar, alone. Darrell had given me his usual honest pre-purchase inspection. He told me that 3135Q would be an expensive airplane to own until I got it in shape. “Don’t buy an airplane with your heart,” Darrell said. “Use your head!” I should have walked away. I stood in the doorway for a few minutes looking at the airplane, feeling badly the way I felt once when I had to return a dog to the Humane Society pound. The dog looked at me through the bars of his cage, whimpered, and then turned away. I walked around the Skylane several times, comparing the airplane and Darrell’s notes. Then I walked toward the door, stopped, and walked back. I patted 35Q on the nose. “You’re going to be trouble,” I said.

While pre-purchase paperwork was flying, I sat on the ground and looked at pictures of 3135Q. I scoured back issues of aviation magazines for Skylane articles, I talked to Skylane pilots, I talked to mechanics about the airframe and the Continental O-470 engine. The picture that I was getting was clear: The Cessna Skylane’s popularity was the result of a perfect marriage between airframe and engine; the Skylane was a tough, serious, load-haul-

ing, high-flying machine. Cessna pitched the airplane to the marketplace as the premier business tool, able to fly four people and a lot of boxes to just about any construction site, at oxygen-level altitudes, almost anywhere in the world.

The dust and fallout of World War II was still settling around the world when Cessna jumped into the small airplane market in June of 1945. The two-place Cessna 140 would become a standard of flight training and grandfather to the most popular airplanes ever built. America was prosperous, and when Eisenhower was elected in 1952 — with a popular vote of 55 percent — life was good. Nearly 62.5 million Americans were working, the Republicans were cleaning out the burdensome Washington bureaucracy of the war years, and American business thrived. The moral battle against Communism had reached a fever pitch, the Armistice was signed at Panmunjon, and from the family farm in Kansas to Wall Street the future of America never looked better.

The big-three airplane manufacturers, Cessna, Beech and Piper, had enjoyed wartime military contracts that kept their production lines robust and the engineers fresh and well-paid and ready to meet what everyone thought would be a boom in civil aviation. World War II had taught people to fly. Neither the Army Air Corps ace nor the Marine grunt would ever again be satisfied to motor about on the surface of the earth, the boosters said. Congress approved a GI Bill to pay for flight training. William Piper, with the J-3 Cub and three-place Cruiser in production, issued a booklet warning small communities that future prosperity depended on the development of airports. Piper testified before Congress in 1945, urging the development of airports. “Every community should be encouraged to provide a convenient and economical landing facility immediately,” he said. The big-three manufacturers knew that their futures depended on getting into the marketplace and defining a niche as soon as possi-

ble. Beech Aircraft believed that their niche in the 'new market' would be to use their Beech-18 experience to produce a fast, efficient, four-place single-engine airplane and let Piper, Cessna, Aeronca and Taylorcraft build the trainers. Cessna test flew the 140 on June 28, 1945, and six months later entered the four-place market when they test flew the Cessna 170.

In less than two years the general aviation boom ended. In mid-March 1947 aircraft sales plummeted. Overproduction of two-place, fair-weather, fabric trainers, a glut of war surplus aircraft, improved airline service and a public that was more interested in starting a family than an engine kicked off a depression in the light airplane industry. Taylorcraft folded, North American couldn't sell its Navion and Republic killed the Seabee production. Aeronca was just hanging on. Piper pledged the company inventory for a loan. Cessna and Beech briefly considered a merger. Beech Aircraft felt the bump of '47, but had, from the beginning, aimed the Beech-18 and Bonanza at the high end of the market. Cessna, well-diversified, continued slow production of the higher-priced 140 trainers, began building the \$7,000 four-place 170, the 'family car of the air,' and focused on the utility airplane market for the future.

On May 26, 1952, the day the United States signed a peace treaty with Britain, France and West Germany in Bonn, Cessna first flew the 180, a four-seat taildragger powered by a 225-hp Continental engine. Introduced in 1953, this \$12,950 airplane could carry 1,030 pounds and fly 860 miles on 60 gallons of gas. With a service ceiling of 20,000 feet, a 36-inch cabin, a climb rate of 1,150 fpm and a stall speed of 60 mph, the Cessna 180 could haul people and boxes into and out of any rough 500-foot strip. As America began the building boom of the 1950s, the 180 had found a home.

The Eisenhower years brought even greater prosperity and unprecedented growth. The picture of a business executive of the

1950s was a man in a hard hat and a suit, on site, reviewing rolls of technical drawings under the wing of an airplane while earth-movers created a duststorm of clay in the background. The strong economic winds moved families from inner city neighborhoods to the sprawling suburbs. Jonas Salk saved a generation of youth when he developed a vaccine that stopped the crippling killer poliomyelitis. The winds of the '50s carried the sounds of a new music called rock and roll, and with it a revolutionary change in the way the culture viewed youth. A young black man named Martin Luther King Jr., who had received a doctorate from Boston University, led a boycott against racial segregation on buses in the South. James Dean embodied his role in the film *Rebel Without a Cause* and launched the image of the pouting, teen-age superstar in Hollywood. While the World War II political establishment faded like General MacArthur's old soldier and Winston Churchill stepped down in favor of Anthony Eden, the American suburbs rocked around the clock with Bill Haley.

On September 20, 1955, Jimmy Dean crashed his car on a California expressway and died, stirring a national wave of mourning. Eisenhower was hospitalized four days later after suffering a heart attack in Denver. On the 26th of September the New York Stock Exchange suffered its greatest dollar loss in history: \$44,000,000,000. That month a Cessna test pilot, E.B. 'Fritz' Feutz, first flew the prototype of the Cessna 182.

The Cessna 182 was born in the evening of America's good times. The postwar sales of Beech's Bonanza and Piper's Tripacer seemed, in part, to reflect a new attitude among pilots. Businessmen, who in the past were satisfied to crawl up into a conventional gear airplane like the Cessna 170, were looking at the more carlike, tri-gearred airplanes. The Navion, Bonanza, and Tripacer all looked a bit more civilized than the taildragger fleet, especially on the ramps of new airports that, as W.T. Piper had hoped, began to spring up in most larger communities across the

United States. Women who had played a vital role as pilots flying airplanes before, during and after the war began appearing as passengers in the airplane advertising of the 1950s. Housewives and secretaries in full paint, fashionably dressed in long skirts, smiled thankfully for the convenience of easy entrance to a difficult seating arrangement in a small airplane. Women weren't pictured standing by Cubs unless they were wearing leather jackets, and they looked best standing on the wing of a Bonanza. Marketing became a word as important as engineering to manufacturers. Madison Avenue showed up at aircraft design conferences. *The Days of Wine and Roses* and Land-O-Matic gear were playing well in Wichita.

Many pilots who were trained in conventional gear airplanes were slow to accept the nosewheel, or 'training wheel' as they called it. The old-timers and the backcountry pilots thought Cessna had emasculated the Cessna 170 and 180, turning tough utility airplanes into citified, prettified airplanes that anyone could fly. And that was exactly what Cessna hoped to achieve. More American towns were laying asphalt runways and ramps in hopes that prosperity would fly into town. The backcountry advantages of conventional gear were far outweighed by the tri-gear's popularity with pilots and passengers who flew from modern airports. Cessna's decision to create a nosewheel 170 and 180 was successful. In 1956, the year of Elvis and *Peyton Place*, Che Guevara and Fidel Castro, the Soviet suppression of Hungarians and the sinking of the *Andrea Doria*, Cessna built and sold 174 model 170s, but a whopping 1,174 tri-gear 172s. Five hundred and eleven Cessna 180s were built in 1956, and 963 Cessna 182s were sold that year at \$13,750 a copy.

A week passed before the papers were ready to sign. Finally the sales department called and said, "Come and get it!" Jeanne and I flew our Cessna 150 down to Minneapolis, stopping by the

hangar first to see how 35Q looked after getting an annual inspection and a bath. It was the first time we'd seen the airplane in daylight, and we were shocked to discover it wasn't red and black, but red and black on one side and orange and black on the other. The shop had run a compression check that showed a couple of cylinders in the high 60s.

"Just fly it," the shop manager said. "It's okay, believe me. Fly it."

When we had finished passing paper back and forth, Jeanne and I went home, turned the 150 over to its new owner, and I returned to Minneapolis to get checked out in 3135Q.

The CFI who was assigned to the project was young and bored and watched me start the airplane with hunched shoulders. He twiddled with the old transponder, tapped his fingers, and then tuned the ADF receiver to a local rock station. Fortunately the reception was so bad that he turned it off and sat back and watched while I ran through the checklist.

I may have been the happiest guy alive just that moment. I was riding high behind the powerful O-470, tuning in ATIS and hearing a clear voice on the speaker, rolling slowly down the taxiway, checking out the DG against the compass, which had a recent fill of kerosene. I moved the heavy controls and did a complete run-up before I called the tower.

On the roll I let 35Q take off when she was ready, but I was still surprised at the 1,500-fpm climb. I smiled at the CFI, who looked at me blankly and yawned. I reduced the manifold pressure to 24 inches and the rpm to 2400, and then I just sat there, deep in the faded red seat of my little rocket, and turned right to exit the airport traffic area.

I tried some steep turns but had trouble holding the nose up in the turn. "Whoa!" my young friend said, waking up, "You gotta use the trim on this thing!" He held the control column back, rolled into a 45° bank and started trimming nose up. "There," he

said. "She'll fly in a 45-degree bank 'til she runs outa gas." I reached for the control wheel and his hand met mine halfway. "Leave it alone, it'll fly just fine."

We decided to try a few stalls. "Show me a trim tab stall," the kid said. "That's the stall that will get you in this airplane." I shook my head and shrugged my shoulders. He pursed his lips and brought the power back, pitched up a few degrees and rolled full aft trim. "There," he said. "Say you've got full aft trim set for a landing, and then you decide to go around, okay?" I looked at him and then at the controls. "So go around!"

I shoved the throttle in and the next thing I knew, the Skylane was standing on its tail. I pushed and pushed against the control wheel but I couldn't get the nose to go down. The kid was laughing and casually rolled the trim forward just as 35Q stalled and fell off on its left wing. I recovered, did a secondary stall and recovered again. The kid leaned over and yelled in my ear. "That's the only thing that will kill you in this airplane! Use the trim all the time — for everything. Let's go shoot a landing."

I was beginning to think the 182 was a bit more than a big 172.

As I turned base and carefully brought the power back, I could feel increasing weight on the control wheel. I trimmed the weight away. On final I felt like I was going too fast and throttled back a bit and pitched up. In a moment I was sinking — like a brick. I pitched over and powered up and retrimmed. The kid was yawning.

About a half mile out I had finally figured out where the pitch had to be set and what power setting would hold it there when the kid reached over and pulled the throttle back.

"You just lost the engine," the kid said. "Land it."

I held 80 mph with the control column and trimmed and trimmed to full aft. "Ahhh, you're getting the idea," he said. "Now see if you can land on the main wheels."

We scrunched onto the runway and rolled a few feet before we turned off.

"I guess we'd better try some more," I said, picking up the mike to call the tower.

The CFI looked at his watch and frowned. "Naw, you got it. Take me back and go flying."

When he got out he carefully fastened the seat belt behind him, patted the seat and said, "Just don't forget that trim wheel!"

I left the Minneapolis area and headed for a small airport about 50 miles from my homebase. I was very much behind the airplane and I arrived at my practice field before I had gotten down to pattern altitude. I flew west to let down, slowly, and then I came steaming back into the pattern trying to slow down on the downwind, which, when I got everything the way I wanted it, put me four miles out on final. I bobbed up and down all the way to the ground and I planted the Skylane with a thump, right on the numbers.

I practiced for a couple of hours until I thought I could make a respectable landing at home. I climbed for the flight home and leveled at 7,500 feet, set the power at 21 inches and 2300 rpm, trimmed the airplane and sat back and relaxed in the seat for the first time that day. I looked around in the cockpit like a small schoolboy checking out his new schoolroom for the first time. I started breathing again and thought, "I'll never want another airplane."

The birth of the Cessna 182 wasn't without troubles. Hooking a nose gear to the taildragging Cessna 180 added 60 pounds to the airplane's gross weight and reduced the top speed by 5 kts. The nose gear was attached to a beefed-up 180 fire wall, but it wasn't strong enough to take the abuse inexperienced pilots were giving it. "Land-O-Matic gear," Cessna said. "It makes flying like driving! This airplane has everything. Unequaled ease of handling

— you drive it up; you drive it down; you can turn and park it easier than an automobile.”

But pilots were having a problem. Transitioning from conventional gear airplanes, pilots weren't sure what to do with a wheel under the nose. Some pilots landed on it; others landed on the main wheels but on the rollout relaxed back pressure on the control wheel and found the airplane wheelbarrowing, or rising up on the nosewheel, and careening off the runway into the weeds. In either case, pilots were putting too great a load on the nosegear and folding it under the airplane.

Tricycle landing gear was catching on, however, and pilots soon discovered that you could 'drive the trike' around on the ground in a wind that made life miserable for conventional gear pilots. The 1956 182 rode high on tall, narrow spring gear designed by Steve Wittman, and when pilots taxied too fast for the wind conditions or tried turning the airplane too sharply, they tipped the 182 over, wrecking the wing tip and prop. In 1957 Cessna lowered the gear four inches and widened the track by five and a half, shortened the nosegear two inches, making it easier to land on the main wheels, and beefed up the slab gear legs to three-quarters of an inch.

Cessna had created a winner. They built 900 182s in 1957 and only 338 Cessna 180s. The 'sissy' landing gear was selling airplanes to men and women for whom an airplane was a tool of business. If nosegear made an airplane easier to control on the ground, then it increased the value of the tool. Cessna was marketing the 182 with the business community in mind. After all, America was growing, cities were expanding and the highways were becoming congested by the suburban explosion. Everywhere there was construction and Americans were beginning to conduct their business in what Cessna called the "hush-flight quietness and new luxury that makes long trips a pleasure. See it. Drive it. Only \$13,750 f.o.b. Wichita.”

One sunny day, after I had owned 3135Q for nearly a month, I made a sweet landing. I was stunned. I powered up and flew around the patch to try it again. The wheels kissed the runway, and I did it again and again. Not only were the landings greasers, but I could put the Skylane where I wanted on the runway. I was learning to manage pitch and power and maintain the pitch by using the trim tab. After a dozen years of flying Cessnas haphazardly, happy to land in the first third of the runway, I had finally figured out what my instrument instructor meant when he said, "Pitch plus power equals performance."

I'd always loved flying, whether I was taking pictures from the air, flying with Jeanne to a quiet camping spot, or just grinding down an ILS. When I started flying the Skylane, I began to learn how to respect the limitations of the airplane and how to broaden my own very narrow abilities. I could see that the airplane was capable of far more performance than I had knowledge or experience. The Skylane was beginning to teach me the pleasures of proficiency.

## Chapter Three

Cessna produced 802 182s in 1958. If you bought the airplane with a fancy interior, three-color exterior paint, a full gyro panel, radios and wheel fairings, you bought a deluxe 182, or a 'Skylane.' But even as Cessna cleaned up the original model and produced a fancy version, sales took a dive in 1960. That year, when Senator John F. Kennedy defeated Richard Nixon for the White House job, only 649 Skylanes were built. Five hundred and ninety-one Skylanes were built in 1961.

The competition was keen. Beechcraft had created a legend. The original V-35 was beautiful, efficient and speedy. The 1960 'M' Model Bonanza was a 200-mph, four-place, rugged rocket that cost only \$5,000 more than a Skylane. A businessman or woman could get in and out of a Bonanza with more grace and fly further, faster and more quietly on 50 gallons of gas than a Skylane could on 60 gallons. The Bonanza also looked good and was popular with a public that had come to identify the butterfly tail with luxury. On the other hand, the public thought airplanes with the wing on top were Piper Cubs.

Piper's Comanche was also Skylane competition, and it had earned a reputation as a strong, pilot's airplane, made famous by the 'Flying Grandfather,' Max Conrad, a Minnesotan who flew

the PA-24-180 and 250 all over the world in the 1960s, breaking Class III and IV records and getting Piper's picture in the papers as he traveled. The Comanche 250 was a 170-mph airplane that sold for \$17,900 in 1958, and it climbed like a hawk and had a service ceiling of 20,000 feet and a range of 700 miles.

The Cessna 182 was a good utility airplane, and it could beat the pants off a Bonanza in the backcountry where a high wing and load-carrying ability counted for more than speed. The Cessna 180 was the king of backcountry bush operations. The 182 was a compromise. It was an easy-to-handle tri-gear that could take its pilot and passengers and a heavy load of fuel deep into the roughest and highest of airports or construction sites at 150 mph, and yet look like a well-dressed pickup truck on an asphalt ramp at a slick, big-city FBO. The 182 wasn't as fast as a Comanche or a Bonanza and not as agile as its cousin, but the airplane created a niche of its own. The Skylane became the town-and-country carry-all of the air.

Cessna had installed cowl flaps on the 182 in 1959 and swept the tail back 35° for the marketing department in 1960. They increased the window size, created 'military-style' flush fuel caps and, in 1961, lowered the landing gear again, another four inches, to increase its stability on the ground.

In 1962 Cessna pumped life into the declining 182 sales by kicking off a major redesign. The fuselage was widened by four inches and the floor was lowered three-quarters of an inch. Electric flaps replaced the 'Johnson bar' flap handle between the seats. Cessna added a back window, which the marketing department called 'Omni-vision,' and a new horizontal stabilizer with a conventional trim tab, replacing the 180-style stabilizer. Cessna increased the size of the fuel feed lines and used two lines from each of the two 32.5-gallon wing tanks. A Continental O-470-R replaced the O-470-L engine, and the landing gear was beefed up — again. The Skylane gained 10 pounds of empty weight but had

a new gross weight of 2,800 pounds, which was paid for by reducing the sea level rate of climb by 50 fpm and scratching 900 feet of service ceiling.

The new Skylane was born, and the basic design wouldn't change again for a quarter of a century. Eight hundred and twenty-five 'new' Cessna 182Es were sold in 1962, the year Americans were building bomb shelters in their basements and the Mercury space program sent John Glenn, Walter Schirra and Scott Carpenter on separate missions in earth's orbit. The Supreme Court ruled against prayer in schools in 1962, and Kennedy sent the Navy and ground troops to Southeast Asia in support of anti-Communist Laotians. In October Kennedy faced off against Nikita Khrushchev by blockading Cuba against Soviet supply ships. Americans watched the evolution of the 'Cuban Missile Crisis' at home, on television, while their children listened to a new British rock group called 'The Beatles' on the radio. The social fabric of America was changing. The threads of the military power and the political might that produced the illusion of stability and integrity during the 1950s were increasingly viewed to be weak and undependable. Even the powerful U.S. military establishment seemed impotent in the shadow of a mushroom cloud, and confidence in the 'American Way' was replaced by a gut-wrenching fear of nuclear annihilation. Arguments about race and religion and education turned families upside-down overnight, and the pitched battles that started at the supper table became violent in the streets. In 1963 Medgar Evers was murdered in Mississippi, Kennedy was assassinated in Texas, and Congress empowered President Johnson to order "all necessary measures to repel armed attack" in Vietnam. The stalwart Kansas farm boy had become a hippie.

Yet Cessna Aircraft sold 40,000 airplanes in the 1960s. They built 700 Skylanes in 1964, 800 in '65, 900 in 1966, and the year that American cities were in flames over civil rights issues and

more than 380,000 young American draftees were fighting in Vietnam, the 1967 Skylane, 182K, was born.

N3135Q was licensed on April 12, 1967.

Early one morning in February, Jeanne and I packed 35Q for a flight to Florida. The temperature, when we left our house in northern Minnesota, was  $-20^{\circ}\text{F}$  and there was a cold northwest wind blowing in advance of an arctic high pressure center in North Dakota. I had installed a Tanis Engine Heater and 35Q was plugged in and wrapped up in a Thinsulate blanket that Jeanne had made the year before. We loaded the airplane with our bags of swimming suits and shorts, a thermos of coffee, cameras, magazines and charts. We then departed the icy runway and climbed into the crackling cold, dark blue skies where we would catch a tailwind at 9,000 feet and motor south with a groundspeed of 180 mph. The Skylane jumped off the ground and we said good-bye to winter.

A half hour later, level at 9,000 feet, Jeanne looked up from her Cocoa Beach brochure and listened. She looked at me. "What's that noise?" she asked.

I'd been hearing it too. The engine was making a kind of whumping noise, a deep rumbling sort of thumping like we heard when our wood stove was back-puffing. I inched the mixture control out and the 'whump, whump, whump' noise increased. I pushed the mixture all the way forward and the frequency of the whumping sound slowed. "The engine is running lean," I said. The outside air temperature was  $-20^{\circ}\text{F}$ . I had full rich mixture and the sound persisted. I pulled the carburetor heat on and the engine seemed to run more smoothly. "Something's not right," I said. "I've got full heat on to keep the engine smooth."

"Can we get it fixed?" Jeanne asked.

"Not today, it's Sunday."

I flew on for a few more miles, thinking about the expensive

prospects of an engine problem in Florida. I called Center, canceled the flight plan and turned back to our airport. I'd take the Skylane to the shop in the morning, get it fixed and we'd leave the next day. Jeanne folded her brochure and sighed. "Time to spare, go by air," she said, smiling, screwing the top on the thermos.

In the morning, standing by my Skylane in the shop, I listened as the mechanic explained that the Skylane's induction system wasn't operating as it should. He'd look it over and get back to me. "I know a lot of guys flying these 182s leave the carburetor heat on all winter," he said, shaking his head. "Maybe it's just the way the airplane is designed."

I'd never heard that one before. My flight training had informed me that carburetor heat was used to remove ice from the throat of the carburetor. I was flying in cold, dense, dry air. There couldn't have been any ice.

The next morning the mechanic called. He said he had good news and bad news. The good news was that 35Q seemed to run well on the ground. The bad news was that there appeared to be an induction leak somewhere and he wouldn't be able to get at it for a week. I told Jeanne and we drove to Florida.

My face was still sunburned when I called the shop a couple of weeks later. The boys had found the leak in a heat riser that was being welded, but they said the plugs were pretty bad, the airplane was using oil at the rate of a quart every few hours, and the compression was weak in a couple of cylinders. The shop owner suggested that I get a top overhaul. It was nearly time for the annual inspection, so I told Jeanne and we went to the bank.

I was no stranger to that bank. We had owned 3135Q for two years and I had used the same chair in the lobby to wait for an 'add-on' loan five times. The banker and I decided we could hang Darrell Bolduc's pre-purchase inspection report on the wall and

just work from his list. I was buying a clean Skylane part by part, nearly in the order that Darrell had listed 35Q's flaws. I hadn't even started on Darrell's 'probable troubles' page yet, and my \$20,000 good deal had cost an additional \$10,000 in 24 months. I was beginning to understand what the old mechanics meant when they said that a quality airplane has a certain value, that there are no 'good deals' and that in the end, you 'pay me now or pay me later.'

Buying an airplane one part at a time and assembling it by the hour is expensive. Sitting in the banker's office I wondered if I ought to cut my losses, sell 35Q and look for a later, well-maintained Skylane.

By 1970 Skylanes started gaining weight. My 1967 Skylane grossed 2,800 pounds, climbed 980 fpm and had a service ceiling of 18,900. In 1970 Cessna increased the gross weight to 2,950, adding 130 pounds of useful load. Of course, they had to get hauling performance from somewhere, so they snipped it from the climb, which decreased to 890 fpm, and the service ceiling, which was lowered to 17,700. Cessna probably performed this miracle of paperwork because the Skylane was slowly losing useful load as buyers added full IFR panels and additional navigation and communications boxes.

VHF omnirange installations were growing at a furious rate, as were airport ILS installations. General aviation pilots were flying on instruments using the air traffic control system, and their radio stacks began to look like an airliner's. Some private aircraft carried more equipment than a domestic 727. An instrument rating was becoming the norm by the end of the 1970s, and a few hours in the ATC system encouraged owners to keep up with the technology and abandon tube sets for nav/coms with integrated circuits, then digital electronics. A well-stacked Skylane had it all: two nav/coms, a glideslope receiver, an

ILS/VOR head, ADF, DME, a marker beacon receiver, RNAV, autopilot, plus a T-grouped panel of flight instruments. Some pilots, who had experienced a gyro loss, added an extra vacuum pump; some included high-frequency radios, Stormscopes, radar and radar altimeters. Owners could buy 50 pounds of electronics for their panels by writing one big check, and if Cessna was going to provide an attractive platform for the avionics craze and not subtract from the Skylane's 'load-hauling' reputation, something had to go. Rate of climb and service ceiling were expendable.

From 1970 to 1986 the Skylane gained 67 pounds of useful load; the gross weight increased from 2,950 in 1970 to 3,100 in 1986. The rate of climb dropped from 980 in 1969 to 865 in '86, and the 18,900-foot service ceiling in 1969 dwindled to 14,900 the last year of production. Cessna also added some weight when they increased the Skylane's range in 1979 by adding 27 gallons of fuel in new integrated fuel tanks, replacing the troublesome rubber fuel bladders. In 1972 Cessna replaced the Wittman slab landing gear with a tubular gear, which increased the track width from eight feet to nine feet and an inch.

3135Q cost \$22,900 in 1967; in 1986 a Skylane cost \$108,650. During those 19 years of evolution, the airplane got prettier and quieter. The Skylane interior turned into a living room of plush chairs that were smothered in wool and leather and faced a larger instrument panel, which reflected the explosion in digital avionics. The 14-volt electrical system was dropped in 1978 and replaced by a 28-volt system, which provided more energy for the starter to turn the engine.

The Skylane evolved as the single-engine airplane industry peaked in the mid-1970s and then declined. A retractable gear Skylane was offered for eight years starting in 1978. You could buy a turbocharged Skylane starting in 1981 and a retractable, turbocharged Skylane from 1979 to the end. Until the end, in

1986, when Cessna only produced 74 straight Skylanes, 10 retractables and 10 turbocharged retractables, the airframe and engine match produced a tough, useful general aviation airplane, capable of flying a family of four with a week's luggage and full fuel 800 nm at 140 kts. Law enforcement, natural resource managers, single-engine charters, aerial survey and photographic organizations, fish spotters, timber cruisers and flight schools all over the world bought and employed Skylanes as airborne carry-alls.

The end came when consumers simply couldn't afford to pay for the increased costs of liability. The social system that produced the affluence of the 1950s and the government of the 1960s and ripped the family from the fabric in the 1970s produced a chaotic, 'me-first' culture in the 1980s. The courts of the people found in favor of 'empowerment' and, empowered, the wounded lashed out against manufacturers, the proud against the press and the schools and each other. In a frenzy of litigation that choked the court system for 10 years, the wounded sought compensation and punitive damages without regard for personal responsibility. Aircraft manufacturers were sued for negligence on products that had come out of the factory in the 1940s, suffered homey field maintenance for 40 years and often crashed in the hands of inexperienced pilots. There was no way for manufacturers to manage that kind of risk; it had to be purchased by airplane customers who were finally not willing to pay the price. If product liability costs didn't snuff the general aviation flame, the recession of the 1980s certainly did. The farm crisis early in the decade shut down family farms all over the midlands, and with the farms went the implement dealers and the groceries and five-and-dime stores. The heartland was Cessna country, and dealers and flight schools were soon stuck with new aircraft and a vanished market. Cessna closed the single-engine factory in 1986 and they wouldn't open another for 10 years.

In 30 years Cessna produced 19,613 Skylanes; it was the third most popular airplane ever produced in the world.

I was too late. The price of used Skylanes had risen 20 percent since 1989 when I bought 3135Q. A newer, well-maintained Skylane was out of my reach. I had flown away 35Q's real value, and I was left with an airplane that needed some expensive loving care and an engine that needed an overhaul. Because Skylanes had appreciated so much, getting another loan wasn't a problem. We bought a top overhaul, a couple of new radios, a paint job, new umbrella fuel caps, another starter and a Loran. 35Q looked good. I brushed up my deteriorating instrument skills with a superb instructor named Jim Tompkins.

"Scan! Scan! Scan!" Tompkins breathed into the intercom. "Keep your eyes moving, get the information, make the corrections and move on. Interesting?" He smiled. "This is a good airplane — learn how to fly it," Tompkins said. "You should be relaxed; let the airplane do all the work. You are just the brains here. Use 'em."

We worked together for two weeks and finally, after a satisfactory ILS, we landed, went into the airport restaurant and Tompkins signed my logbook. "Flying well is an attitude," he said. "It doesn't make any difference who you are, what you fly or how long you've been flying. If you drop the ball, if you quit, if you stop being a pilot while you are at the controls, you're going to get hurt, and worse, hurt someone else." He looked outside at 3135Q parked in the sun. "And wreck that pretty Skylane." He thought for a moment, and when Jim has a thought he looks you straight in the eye while he lights his pipe. You wonder if he has asked a question and is waiting for your answer. "The problem is, a lot of airplane drivers don't know what 'being a pilot' means," Tompkins continued. "They think the pilot is the one that sits in the left seat and pays the fuel bill. No. A pilot is

part technician, part artist, part manager. A pilot is someone who is in control of himself, his machine and his flight. Control, Dick, that's why most of us like flying airplanes. We like being in control of our lives. And if we are any good at it, we learn that we need information to be in control. We need data to process, we need a problem to solve. If we are lazy and we stop gathering information, stop learning and start thinking that we know it all, we lose control. Do that on an ILS and you will probably die. Interesting?"

"So what can I do to get better ...," I began, but Tompkins cut me off.

"Learn everything you can about that airplane out there. Learn everything you can about the weather, ATC, airports, charts, systems. ... Dig out your private pilot textbook, the airplane manual, the instruction book that came with your EGT, and read it all. A pilot is a student of flying forever. Every time you fly, set a standard for the flight. Maintain a heading, an altitude, an airspeed; don't let yourself accept anything but perfection — then you'll start learning. When you set the standards and maintain them, you'll be in control. Get your CFI, Dick, teach others to fly — then you'll learn."

I could still see that Irish smile as I climbed through 4,000 feet for the flight home. I watched a broken line of stratocumulus sink beneath my wings, and I wondered as I climbed how anyone could ever spend the time to learn it all. I needed to know so much. Then I remembered something else Tompkins said. "You'll never know it all, but you'll become proficient when you make the commitment and begin to apply what you've learned."

For a few weeks I studied. I signed up with Dave Moran for a flight instructor course, but then my business needed attention and my flying became routine. I felt like I knew what I was doing until my engine quit that October and 35Q was scattered all over the shop floor.

I had two students ready to launch the day I got my CFI. As we climbed away from the airport, I watched their pleasure at being at the controls of an airplane. Instructors never forget those smiles, those bright faces that have just discovered that they can fly. And I'll never forget the first questions that I had to beg off and promise to answer the next day, and the nights that I spent deep in the textbooks, trying to understand the aerodynamics of a spin so I could explain it, so I could know it and control it. And as I gained some knowledge and began to understand how it is that an airplane flies, how a low pressure center is born along a stationary front and what happens when a constant speed prop loses oil pressure, I began to experience a kind of flying pleasure that I had never dreamed existed. My wife, my life, my business became buoys in a very fast stream that I navigated with enthusiasm. I awoke in the morning with a passion to begin the day. I found myself developing confidence in everything I did. When I made mistakes, I corrected, got back on course and 'flew the airplane.' I was beginning to experience the rewards of the flying life.

When 35Q was finished and flying, I ordered a new manual, studied and organized the airplane's paperwork, joined the Cessna Pilot's Association and read John Frank like an existentialist would read Henry David Thoreau. I read Richard and Leighton Collins, Richard Taylor, Bob Buck and William Kershner. I read my old copy of Langewiesche's *Stick and Rudder* so many times and made so many notes in the book that had to buy a new copy.

But it was my students who, in the end, taught me to fly. It was John who taught me how to land an airplane and Julie who taught me to navigate. Erin and Danny drove me into the textbooks and left me there, night after night, where I learned, finally, how an aircraft electrical system works.

I was with Jerrod Nelson the day we flew through a rainbow,

and I found myself buying a meteorology textbook the next day. I started spending my free time with staff meteorologists at a National Weather Service office, making friends who could teach me how the atmosphere works. I was becoming a junkie for information, and my search pleased Jeanne because she could see that I was living with a fullness that I hadn't experienced before. I was committed, even dedicated, to learning as much as I could about flying, and because flying is just life, I was committed and dedicated to living. An airplane is just so much aluminum and steel and rubber and plastic, organized to do what birds have done all along. An airplane is an achievement of man, and flying one well is an achievement of will.

It is the dead of winter today, as I write. In the distance I hear a familiar Skylane droning over a nearby freeway. The Minnesota State Patrol is clocking speeding motorists, homebound from a weekend in the northcountry. In a few hours that Skylane will be unpopular with a good many people. In an hour I'll be driving out to the airport and unplugging my Tanis Engine Heater and my Toastmaster 750-watt ceramic interior heater and pulling 3135Q out into the cold afternoon. I'll climb on board and start the engine, and when the engine temperatures are stable, I'll fly a short 30 miles to the airport where my Skylane will go through its eighth annual inspection since I have owned it. 35Q has become quite an airplane these last few years. There isn't much that isn't new or overhauled or refurbished. I've spent a bit more than 2,500 hours in her, and 10 times that number in dollars. I own a \$50,000 1967 Cessna that has helped me learn how to live a full, rich life.

Five years ago I was sitting on my leather flying jacket on a cold hangar floor wondering what doors my airplane would open for me. I'm standing in that doorway today, looking at tomorrow's bright light. I'll step forward now and begin the journey.

## Chapter Four

From some distance a Cessna Skylane is a totally unremarkable airplane. Parked on a flightline with a bevy of 172s, a Skylane is nearly invisible; tied down next to a Cardinal or a 210, the Skylane is a bit of a frump.

But as you approach a Skylane it gains stature, and when you walk around one, touching it, feeling its bulbous surfaces, the airplane strikes you as being beefy overall and quite nice-looking — from certain perspectives.

The Cessna marketing department tried hard to paste a little pizzazz here and there, especially during the later years when the Skylane edged out of its niche. Like a Midwestern farm girl, the Skylane needed a bit more than a pretty dress and high heels to hang out with the likes of Mooney and Bonanza. Nevertheless, Cessna marketing ordered drooping, conical wing tips, flamboyant wheel fairings and a rakish vertical stabilizer, and they applied color schemes that made the airplane look longer or bigger or faster or heavier or smarter, depending on the designer and the year and the competition.

Skylane buyers, on the other hand, were looking for an airplane that could easily haul three big construction workers and a 200-pound box of parts 150 miles and land on a 1,000-foot

stretch of highcountry road. On weekends the airplane could motor a family of four from Billings, Montana, down the Front Range to Denver and back with a day's shopping stuffed into the cargo hold.

A wheat farmer in North Dakota steps outside just as the sun rises and loads a combine driver and a field hand into his Skylane, parked a few feet from the ranch house, and flies a couple hundred feet off the ground for 10 minutes and lands a few feet from the combine. "See you guys at lunch!" The rancher opens the door and the boys climb out and walk to work. An Idaho cattle rancher and his son drop hay to the herd marooned by an overnight blizzard. A planeload of weary environmentalists track wolves that are wearing radio collars across an endless sheet of dark, wintertime tundra. A tired, young flight instructor flies a timber cruiser in wide, slow circles 500 feet above a stand of ash trees, an hour from home and gas and food. Yesterday he flew the same airplane with the seats removed. For five hours he took off, climbed to 12,500 feet, opened a special door, waited for three skydivers to exit, and then pulled the throttle back and glided down to pick up another load. A real estate woman in Indiana had her 1979 Skylane interior redone in wool and leather and she flies out of an airpark with a Skylane-load of builders looking for a nice site along the Wabash River.

"When the going gets tough, the tough get Skylanes," a fire patrol pilot told me one day. Then he hitched up his pants and crawled back into his 'Lane' and flew up into the mountain pass where his observations would direct fire crews to an early spring Colorado forest fire. A northern Minnesota flying service uses its 1966 Skylane for everything from aerial photography and sight-seeing to skydiving and instrument training. They evacuate the sick, the lame and the dead from the Rainy River bush country, and they fly their Skylane on wheels off asphalt, grass, snow, ice, mud and sand. The Skylane flies from a vast runway of ice in the

middle of Rainy Lake, transporting ice fishermen to and from their fishing grounds. "It's a workhorse, that's for sure," Francis Einarson says. "It's the best all-around airplane I know."

The aviation magazines drag out old pictures of Skylanes and rate the airplane with its competition in clocklike regularity: "The Best Under \$30,000" or "The Best Over \$30,000," "The Best Used Four-Place," "The Best Compromise Four-Place."

Whenever the Skylane is mentioned in the running, the airplane comes out on top. If the writer has actually spent some time in Skylanes, the airplane gets high marks for its stability, comfort, airframe/engine marriage and load-hauling abilities. It always gets low marks for its speed and economy. A couple of years ago Bill Cox, faced with writing an annual comparison piece for *Plane and Pilot* magazine, said: "In the never-ending search for aeronautical utopia, there probably is no more capable all-around general aviation airplane on the face of the earth than the Cessna 182 Skylane. There, we said it and we're glad."

So what makes the Skylane the best in the 'all-around' class?

Walking around the airplane we get some idea of its purpose in life. The 230-hp, 470-cubic-inch engine suggests that designers intended to continue the Cessna 180's load-carrying abilities. One look at the broad, 36-foot wing, heavy lift struts, spring steel or tubular gear and the 11-foot horizontal stabilizer, all festooned with rivets rising into the airstream, suggests that speed was never to be a Skylane attribute. The massive, 42-inch cabin, however, with roomy rear seating and spacious panel, tells of a utility role or, like the flamboyant 1956 Buick, that the airplane was designed to be a first-class family cruiser. The Skylane design lacks the delicate finesse of a Mooney, the grace of a Bonanza and even the relatively clean aerodynamics of a Cherokee 180 or 235, but there are few airplanes, and none of the above, that can match its beefy, country heft.

The Cessna designers of N3135Q employed the O-470

Continental engine, the 82-inch McCauley two-blade constant speed prop and the NACA 2412 wing to lift 2,800 pounds off the ground at a rate of 980 fpm. The engine/prop combination tractors 1,620 pounds of airplane and 1,180 pounds of fuel, friends and freight through the air at 150 mph for about three and a half hours. No matter how hard marketing tried to citify the Skylane, it never went anywhere fast and it never went anywhere quietly or economically. But 19,613 Skylanes were crafted, sold and flown by pilots who wanted the stability, the simplicity and the load-carrying talents with a center of gravity envelope that included nearly all the space between the panel and the tailcone. The Skylane paid for this vast envelope and flight stability with surprisingly heavy pitch forces. It's a truck.

When we preflight a Skylane, we look for weakness in the integrity of the airplane. In many ways an airplane resembles an egg shell: In good condition the 'container' can endure tremendous loads and impressive weight. But once the shell is broken, cracked or appended with unbalanced surfaces that create harmonic vibrations, the integrity of the container is compromised. When we preflight a Skylane, we look for integrity from the spinner, which streamlines and protects the hub of the constant speed propeller, to the tailcone; from the wing tips to the faired tip of the rudder. Although the Skylane is relatively free of so-called 'killer' items on the preflight checklist, there are a few areas of concern. A few years ago John Frank, Cessna guru at the Cessna Pilot's Association, sent a letter to all Skylane owners drawing attention to the problems with fuel bladders and fuel caps, the insidious nature of carburetor ice and the poorly designed O-470 induction system, which can cause trouble during cold-weather flying and while burning auto fuel. John pointed out the troublesome uneven fuel feed from left and right tanks and the irritating difficulties with the fuel vent. Seat tracks have

been an issue on all Cessna singles as the fleet ages; the Skylane pilot who finds himself sliding back on takeoff will have an interesting time of it regaining control.

Missing screws or a variety in the type of screws that attach the spinner to the hub greatly affect the balance of the spinning propeller. A prop spinning a bit out of balance sets up vibrations that attack the integrity of the cowling, the engine mount, accessories, instruments and fittings throughout the airplane. We look very carefully at the prop for faint streams of oil on the blades, which suggest an immediate inspection of the prop hubs, and we look at the cowl for signs that oil is escaping from the crankshaft seal. If the airplane was flown in very cold temperatures and the engine breather became frozen, the pressure may have pushed oil out through the oil filler tube and the crankshaft seal.

We feel the blades for smoothness. If there are nicks, which can be common even in an asphalt airport environment, we will want to get them dressed by a caring A&P as soon as possible. The propeller blades, of course, are wings that produce a form of lift that we call thrust. The effectiveness of the blades to produce thrust depends on their aerodynamic quality, which is compromised by nicks and abrasions, insects and sloppy paint jobs.

Getting down on our hands and knees we inspect the engine cowling for 'smoking rivets,' or streaks of gray aluminum oxide that stream from ill-fitting rivets loosened by vibration. While we are on the ground, we check the exhaust stack to be sure it is secure, and we check the cowl flaps, which should be tight. If the airplane is aging gracefully, the cowl flap hinges have been replaced and the flaps are secure and move smoothly. We inspect the nosegear oleo strut, which is simply a cylinder and a piston. When the nosewheel impacts the runway, the piston is driven into the cylinder with resistance provided by hydraulic fluid and nitrogen. To prevent the nosewheel from turning on the piston, torque links and a shimmy damper are installed to keep the wheel

tracking straight. Rough runways, high-speed taxiing, fast landing rollouts and sloppy pilot technique lead to loose torque links and failed shimmy dampers. You'll often hear hangar pilots say that Cessna nosegear is susceptible to shimmy. The truth is that many Cessna pilots drive their airplanes on the ground. "We don't drive an airplane, we taxi it," Jim Tompkins used to say. "The nosewheel assembly helps us to track along a ground course. We do this slowly and gently just as we allow the nose to touch the runway only when we have slowed during our landing rollout." If the torque links are loose, no amount of shimmy damper maintenance will solve the problem. We'll need bushings and some practice taxiing.

The fluids of a healthy airplane are found inside the engine and sumps, invisible during a preflight. When we see oil and fuel and hydraulic fluids dripping on the ramp or streaming on the airframe, we need to get it checked out.

Getting up off the ground, we feel the Dzeus fasteners that hook the cowling to the airframe. They should all be there, and they should be snug.

We check the air filter to be sure that it is clean, and we check both static ports to be sure that they are open. The small scoops above the static ports on older Skylanes are instrument cooling vents, replaced by flush mounted scoops in 1976.

The cowling really serves two purposes. Like the prop spinner, it provides aerodynamic streamlining across the engine, but its real contribution is to enclose the engine compartment and create a pressure chamber where airflow is directed over the cylinders and down through the cooling vanes. There's a U-shaped fence around the top of the engine upon which lies a strip of rubberized baffling. This is not a cushion to protect the cowling, but an integral part of the pressure chamber. The baffling must be in excellent condition and folded forward so that the airflow doesn't escape the chamber. Bad things happen to this baf-

fling over time; it becomes worn or torn and folded back when either an owner, who doesn't know the function of baffling, or a mechanic, who doesn't care, manages to reinstall the top cowling without carefully checking the baffling's position. When the baffling fails, and ram air flows through the back of the engine instead of down through the vanes, the cylinders will not be properly cooled and they will have a very short life.

Of course, we check the oil, and we check the oil filler cap to see that it is snug and that there isn't fresh oil on the filler neck. While the access door is still open, I have found that much can be learned by sticking my nose in the engine compartment and taking a deep sniff. A healthy compartment has no strong smell of either oil or fuel.

Preflighting the wings and lift struts of a Skylane should take a few minutes. There's 174 square feet of wing to check out, and all of it is important. At the wing roots I look for signs of fuel or the blue dye of 100LL. If a bladder is leaking, or if the connections on the fuel sender or fuel line are leaking, you'll find traces of dye or a fuel smell at the wing root. Until 1979 Skylanes had rubberized fuel bladders, which are organic and tend to dry out and crack; they don't last forever. The average life of a bladder is ten years; after that you may see signs of leaking. If the bladders have been kept filled with aviation fuel and the airplane has lived in a hangar the bladders may last 20 years. Many Skylanes are STC'd for auto gas, and although the fuel isn't harmful, there are additives in car gas that attack rubber. The recent move to include ethanol in auto fuel is especially hard on rubber parts of the fuel system. From 1972 to 1979 Cessna installed fuel bladders that were a Goodyear rubber product called BTC-39, which, as it turned out, deteriorated rapidly — sometimes becoming brittle and at other times soft and mushy, leaking badly in either case and mandated by Airworthiness Directive to be replaced with a stiffer, urethane material called BTC-67. The stiff BTC-67 mate-

rial was difficult to install in the wing and often it was put in incorrectly and wrinkles developed. Although the AD required 'smoothing and blending' of the wrinkles, a large number of airplanes flew with poorly-laid bladders and water was trapped, particularly at the inboard rear corner, until takeoff, when the water rolled down the fuel lines and stopped the engine. The FAA issued another AD requiring pilots to shake the wing and roll the wing and otherwise try to dislodge trapped water to the wing sumps at preflight. Amazing amounts of water were sumped by pilots, and water was discovered in the fuel of crashed Skylanes as well. Many owners retanked their airplanes, getting a better fit, while others 'rock and rolled' their Lanes habitually. Pilots were encouraged to get rid of the stock, military-style, flush filler caps, which had irritating O-rings that rolled out of position and were great places for rain water to pond before it leaked into the tanks. The umbrella caps are standard fare these days; you don't want to operate a Skylane that doesn't have them.

Looking carefully at the wing root fairing, we want to be sure that the screws are in place — and that they haven't rusted beyond recognition. We also check for evidence that the fairing was removed at the last annual inspection. There's a lot of interesting stuff up there in the root of the wing. The wing bolts are there. The half-inch fuel lines appear with exposed connections for a few inches and then quickly dive into the fuselage out of sight. During an annual inspection an A&P ought to have a good look at the fuel line connections and replace the insulation, which has likely gotten wet over the years and become moldy.

The leading edge of the Skylane wing should be clean, the cabin air vents clear and not home to insects. Nor should the pitot tube or vent on the left wing appear to be obstructed. We don't blow or suck on the pitot tube since it is a delicate instrument that measures dynamic air pressure. A puff from a mighty pair of

lungs will damage your airspeed indicator. If you find an obstruction, say a bug, you will have to disconnect the plastic line behind the airspeed indicator and try to blow the offensive bit backwards, out the pitot. A few minutes under the instrument panel lying upside-down, legs akinder, blood rushing to your head, will also help you to appreciate the shop rate at your local FBO, which is the place to go if you can't clear an obstruction in the line.

The fuel vent on the left wing of the Skylane is an interesting place to stop for a moment.

In order to avoid slopping fuel all over the windshield, Cessna engineers designed a new fuel vent for the prototype 182 by removing the 180-style fuel vent between the wings above the cockpit and placing it on the bottom of the left wing, just behind the lift strut. Here, because of some very complicated aerodynamics, an airplane moving through the air produced enough dynamic pressure in the upper strut cuff to pillow it outward, which, in turn, would cause a low pressure area to 'suck' fuel from the vent. Some operators tried to move the vent up or down, but you'll find Skylanes with duct tape wrapped around this cuff. Or you may find the logbook entry for the Cessna 'fix,' which involved stuffing a bit of sponge-like material under the cuff to open an air passage.

A related difficulty has plagued Skylane owners from the first 182 until the 1979 model. With the fuel selector on 'both,' the Skylane pilot often finds the engine is being supplied by fuel from the left tank alone. As a flight progresses, the right wing, with nearly full fuel, gets heavier and heavier. The reason this is happening is that the left tank is efficiently vented to the outside air. But the right tank is vented through the left tank by use of an interconnecting line. Because of wing dihedral and sloshing fuel in flight, this air vent often fills with fuel, which siphons gas from the left tank to the right. There's no danger here; the engine will

get fuel when the selector is on 'both,' but the airplane will become right-wing heavy. In 1979, when the Skylane was modified with an integral bay, or wet wing, the fuel system was designed with vents under both wings. Since efficient fuel tank venting is a problem with Skylanes, the pilot will do well to check the vent carefully.

As we move along the left wing, we want the stall warning indicator tab to be loose and free to rise and fall; we want the end caps secure, cracks stopped-drilled, nav lights working and lenses clean and not cracked.

The aileron hinges are worth looking at carefully for signs of wear or abuse. The hinge should be tight and secure, free-moving and clean. The aileron should move smoothly 20° up and 15° down, plus or minus 2°.

The Fowler flaps on a Cessna Skylane are massive and impressive. They ride on rollers, which should show signs of maintenance. If you grab a hold of a lowered flap and move it gently, you'll note that the flap seems a bit loose, which is okay as long as the rollers are well-maintained and the tracks are straight, not cracked and not excessively worn. I look at the bracket that attaches the roller to the flap. This support arm has been the subject of a Cessna Service Bulletin, and the pilot needs to see that the arm is not excessively worn. We look closely at the attach points of the track itself, especially at the wing where the track is attached to the wing spar. If pilots have been operating the flaps with too great an airspeed, the damage will likely show here first. Of course, the flaps should come down smoothly — and together — without jerking and without any strange screaming or scrunching noises. I peek at the clearance between the inboard flap and the airframe.

I have had only one flight where I experienced asymmetrical flap deployment, and I had a wild time of it until I collected myself, got the flaps up and went home.

The tires of a Skylane tell a lot about its pilot and the flights that are conducted. If there is wear on the outside edge only, many of the flights are flown undergross, single pilot, full fuel. If the wear is even across the tread, the airplane is flown at greater weight. Bald or flat spots suggest the pilot found himself in a tight spot and turned the airplane on one wheel. Tires should be replaced if the tread suggests an aggressive landing, if there are flat spots or, obviously, if the tread is a bit thin. The \$200 you'll spend to buy new tires every year is a lot less than the cost of a wing tip or prop, should you blow a tire on rollout. The wheels manufactured during the 1970s often employed McCauley three-piece magnesium assemblies that had a long and strong history of cracks that could lead to failure. Give the wheels some extra time; pick away the chipping paint and really hunker down on an inspection here. While you're there, look at the brake discs for corrosion, pitting and general wear. Of course, there shouldn't be any hydraulic fluid anywhere but inside the lines, and there shouldn't be any kinks or abrasions on the lines themselves. Any bright scratches or sweeping abrasions on the discs are cause to call an A&P.

I drain the left sump into a fuel sampler cup while I'm in the neighborhood of the wing root again, and I look for bits of debris and water. For some years I used auto fuel in my Skylane, and although I never had engine troubles because of it, I did see a lot of interesting junk appear in my sampling cup. Some of the floating bits arrived, I'm sure, with my gas cans; some came while I was filling the cans at gas stations; and some, who knows how many, came from the gas station tanks and fuel supply. When I started having engine troubles, I stopped using auto gas just to cut down on the overwhelming number of variables. Aviation-grade fuel is a stable commodity, for the most part, and using an FBO's fueling operation cuts down on the number of transfers and chances for debris to end up in your sumps. Avgas costs about 30

to 50 cents a gallon more than auto fuel, and I've decided that it's a low price to pay for dependability.

Before the first flight of the day I find a ladder and climb up to the top of the wing to have a look at the fuel tanks and the filler caps. I scan the top of the wing to see if there are any changes in the condition of my ADF sense antenna or communications antenna. I look for any changes in rivet condition or unusual stress. From above I can see the stains of fuel that may have departed the tanks under pressure, a warning that something's amiss in my venting system.

As we start along the empennage, I always check to see that the baggage door is locked. Someone in eastern South Dakota has a nice pair of gloves that departed 3135Q one day, something I wasn't aware of until I landed at Rapid City and found the baggage door open. I shake the horizontal stabilizer a bit, just to see if it will come off in my hands. It never has and I credit that to thorough annual inspections of the attach points, looking for cracks in the brackets and doublers. There shouldn't be any bulges, ripples or cracks on the surface. I look for damage on the left side, where the prop is likely to blow abrasive sand and dirt or the occasional stone. And I get down on my knees again and look under the stabilizer for damage, cracks or dents. I check out the weights in the elevator; they should be solid and not cracked. I apply the same qualification to the vertical stabilizer, checking too for an operating beacon and solid nav antenna. When I get to the trim tab on the right side of the elevator, I slow down again. I get down and really check the tab actuating arm and the attach points. The trim tab should move very smoothly from stop to stop. If you've got one that is tough to turn or binds, get it fixed. When we start flying the Skylane, the trim tab will be moving a lot. It should move smoothly. I once flew with a man who didn't use the trim because, over the years, the pulleys had gotten bent and he couldn't turn the trim wheel. Rather than get it fixed, he

flew with a neutral setting and muscled every pitch change. He was always tired after an hour of flying, and we never experienced a good landing until he spent some money on the trim system.

I preflight the right side of the airplane just as I did the left, and then I stand back a few feet and look at my machine. It should look bright and straight and young and fresh. Airplanes project a dull, tired appearance when they aren't feeling well. Sick airplanes lean on one strut or are clunked down on their nosewheels or pitched up high with streaks of red fluid dripping down the strut.

I do a thorough preflight at the beginning of every flying day and a so-called walk-around between legs. If I have been away from the airplane for several hours, or if I find that line service has moved her, I give the airplane a good top-o-the-wing-to-belly scan to see that it wasn't towed over a curb or beneath a low-slung door. I double-check that the controls are free and smooth, just as they were when I landed.

Dave Moran told me that a good preflight does two things: "You check the airplane and you check the airman." The process is a bit like what happens to an actress in her dressing room as she prepares for her part and adopts the persona of her character. We are trying to adopt the persona of a pilot, and we become involved in the role by inspecting the airplane. When we leave a business meeting or a family get-together and drive out to the airport, we are people of the earth, tied to the frustrations of getting it on in this life. When we approach the airplane with the intent to fly, we have to find a way to become pilots and put away our earthly concerns. If we can't do this during preflight, we are not ready to fly. I had a student who, mid-preflight, got up off his knees and excused himself to make a phone call to his office. "I just thought of it," he said as he walked away. If you are still thinking about your office when you are on the line preparing for

flight, stop. Finish your business and come back and start all over again. I make it a habit to preflight my airplane alone. It's a lousy time to say good-bye to relatives and a worse time to cheer up nervous passengers. The airplane is the thing, and when we climb into the cockpit we are pilots.

## Chapter Five

I've always thought that Cessna designed the 1962 Skylane for 250-pound Kansas cattle ranchers. The cockpit is big, four feet high and 42 inches wide. The back seats are high off the floor and broad enough to put a couple of good-sized people back there where they'll sit comfortably, with plenty of legroom, for a three-hour flight. The front seats, or chairs, sit tall and, depending on the model year, articulate high, low and aft with enough movement that just about anybody, tall or short, thin or greatly rotund, can comfortably pull themselves forward and face the controls. Once you've pulled yourself forward, the back-seaters can stretch out and read the Sunday paper. There is eight inches of space between the front seats where you can slide a box of Jepp manuals and keep a thermos, a couple of cups of coffee and a flashlight.

And once you've pulled yourself forward, you'll find yourself holding a hefty control wheel. The Skylane control column is an inch and a half round, and when you pull on it, you'll find there's a lot of weight on the other end. Here's where the Cessna 150 or 172 pilot first recognizes that the Skylane is a relatively large airplane. Big balance springs in the tailcone and counterweights in the 11-foot-wide elevator give the Skylane controls their heft,

and the big control surface gives the airplane remarkable authority and stability in pitch in the air.

The panel is large too, and it grew taller over the years as general aviation airplanes began to carry a sophisticated array of flight, communications and navigation instruments. If we could produce a time-lapse movie of factory-installed Skylane instrument panels over the past 30 years, the film would show gauges and radios darting about on the panel like so many bees working on a honeycomb.

Originally the airplane was outfitted with required VFR flight instruments and fuel gauges, oil pressure and temperature, cylinder head temp, rpm and manifold pressure gauges. The flight instruments were scattered all over the left side and center, while engine gauges nested on the right. As the electronics industry moved toward transistors and digitized displays, and as general aviation instrument flight became popular, the panel designs reflected a trend to organize the flight instruments in a meaningful way. The T-grouped flight instruments became the rule. The all-important central attitude gyro is now flanked by the airspeed indicator on the left and the altimeter on the right. The directional gyro is flanked by the turn and bank, or the turn coordinator, on the left and the vertical speed indicator on the right. Cessna managed to establish a center stack of radio and nav receivers in 1962, with enough space to set up a useful IFR package without spilling boxes over to the right side. In the 1970s, however, during the explosion of high-tech navigation and airspace reforms that required transponders and made efficient use of area navigation, the center stack wouldn't hold everything and a second stack evolved on the right side of the panel.

The Skylane pilot found plenty of room on the panel to mount the required boxes with space left over to install thunderstorm detection equipment, right-seater flight instruments, pictures of the kids and homey slogans and reminders that the pilot will shut

the door and fly the plane and trust in God. During the dark days of the '80s when the government required manufacturers to issue placards that warned pilot, crew and passengers of every airframe, instrument and system nuance, the cockpit began to look like the entrance to a nuclear testing site.

Beneath the instrument display was a subpanel upon which lived the switches and circuit breakers, lights and fuses. It was here, just above the pilot's knees, that you began a cockpit pre-flight, checking switches off, primer in and locked, and circuit breakers in. As you moved your hand to the right, you found the carburetor heat control, throttle, prop control and mixture. Just above the knees of the right-seater, Cessna installed the flap switch and indicator and a cigar lighter, which has either been disconnected in most models or re-fused. The fresh air and heater control knobs reside alongside the defroster control and a spacious chart box. Beneath the power quadrant, on a center pedestal, the pilot checks the elevator and rudder trim wheels, the cowl flap control and, at the base, the fuel selector. From the beginning Cessna had created an ergonomic flow of instrumentation, years before the word found a place in our language.

In the 1960s a Skylane was flown principally in visual flight conditions using the airspeed indicator, altimeter and compass. The pilot looked through a big front window at the broad Kansas horizon to set the pitch, applied power and trimmed the airplane for hands-off cruise a few thousand feet above the ground. You could fly a Skylane from coast to coast, or from the ranch to the city, and spend \$3.75 an hour for fuel. Pilots followed roads and railways and section lines and rivers, and they got where they wanted to go unless they ran out of gas or pressed on, unqualified, into the clouds or rain or snow or fog and flew into rising terrain. But in the late 1960s and early '70s, as pilots sought greater utility of the small airplane and the electronics industry

began to produce sophisticated and relatively inexpensive instrumentation, the GI Bill made advanced and instrument flight training affordable. Financed by the millions of federal dollars let loose on the aviation industry, instrument flight schools popped up everywhere and taught pilots to use three-inch T-grouped flight instruments. The basic IFR panel first showed up on Skylanes in 1968. In the 1970s and '80s the airplane featured additional instrument flying tools: The turn coordinator replaced the turn and bank, the split master switch isolated the alternator, an avionics master switch isolated the \$25,000 radio and navigation package from an electrical surge at start-up, noise filters in the electrical circuits increased the clarity of radio communications, and static wicks appeared on the control surfaces, reducing annoying precipitation static by discharging the accumulation of static electricity. Antennas grew on the belly and wing top, along the empennage and on the vertical stabilizer. And for the next 10 years, additional soundproofing, overhead speakers, IFR radio packages, flap preselect switches, control wheel buttons and switches to talk, trim, light and ident the transponder all made the Skylane an efficient, IFR, cross-country machine that got heavier and quieter and smelled of leather. Pilots donned oxygen masks and climbed to mid-altitudes, the airspace vacated by jet-powered airliners and turboprops, and flew the dog legs of the VOR system and point A to point B direct, using area navigation. The instrument panels grew taller and wider and were illuminated by backlighting and spot lighting, electroluminescent panels, eyebrow and post lights. If that wasn't enough light, you could buy after-market flashlighting that clamped on the control wheel or in your pocket or strapped onto your head. Pencil pockets and approach timers appeared for the conscientious instrument pilot, and the left seat articulated fully so an instrument pilot could lower himself away from the electrical distractions of the connective outside world. There, buried deep in his Cessna cocoon,

facing a glowing panel of sophisticated flight instruments, monitoring the autopilot, wearing noise-canceling headsets and speaking softly into an amplified electret boom mike, the Skylane pilot of the '90s had the same presence on the air as the crew of Concorde.

The cattle rancher could barely see out of the airplane anymore, and the days of following the roads from Amarillo to Denver were, ergonomically at least, over.

The Skylane power plant, however, hasn't changed much since 1956. The union of the 230-hp Continental O-470 and the 182 airframe was a marriage blessed in Wichita, and after 30 years it continued to attract buyers to the airplane. The original, the Continental O-470-L engine, was, for the most part, the Cessna 180's 'K' engine. To install the 182 nosegear, the carburetor was moved and the intake manifold and oil sump were redesigned. In 1962 the O-470-R engine changed the configuration of the crankshaft and carburetor, but it provided thrust for the series until 1975 when the 'S' engine introduced oil-cooled pistons and a semi-keystone ring design. In 1977 the O-470-U was born. This engine produced 230 hp at 2400 rpm by increasing the compression ratio from 7:1 to 8.6:1. This high compression ratio produced the same horsepower at a lower rpm setting, making it a quieter power plant but dependent on 100LL aviation fuel.

The Continental Motor Company first certified a light airplane engine in 1931, 27 years after Ross Judson, a Mankato, Minnesota, native, founded the Autocar Equipment Company. Judson produced specialty engines and found fresh designs in lightweight materials when he visited Europe in 1900. The 'Continental' technology so impressed Judson that he renamed the firm Continental Motor Company in 1905. Continental produced engines for the Auburn, the Hudson and the Studebaker

automobiles as well as the military. In 1927, the year Lindbergh inspired young hearts to fly, Continental Motor Company was worth \$28,000,000. In 1931 Continental's horizontally opposed, air-cooled A-40 engine was installed on the new Piper Cub and Taylorcraft, and the engine evolved during the decade into the A-65, which became the industry design standard. World War II contracts for tank and aircraft engines gave Continental Motors solid technical experience and a healthy financial grip on postwar engine development. During the war years the 'C' series engines replaced the old 'A' and, after the war, an 'E' series was developed to power the all-new, and beautifully designed, Beechcraft Bonanza. The E-225 was used in the E-35 Bonanza and its competitor, the Ryan Navion. The E-225 displaced 470 cubic inches and, during the late 1940s when engine manufacturers began naming their engines for their displacement, the E-225 became the Continental O-470. An O-470-A powered the first Cessna 180 in 1953, and two years later the 180 was flying with an O-470-J. Variations on the O-470 theme provided the thrust for the Bonanza, the Navion and the Cessna 180, and in 1956 the 182 rolled off the production line empowered by an O-470-L.

In the field, the O-470 'K' through 'U' series were thought to be good engines with quirky induction systems. Continental had never designed an effective way to keep the carburetor warm on Cessna 180 and 182 installations. Located some distance from the warm engine environment, carburetor temperatures were influenced more by the outside air than the heat of the engine.

Since complete vaporization of the fuel and air mixture is dependent on carburetor temperatures of at least 40°F, the O-470 series were complicated engines to fly in the winter. Incomplete vaporization of the fuel caused lead fouling of the bottom plugs and 'over-lean' mixtures. All of this was a bit embarrassing to a Cessna 180 that had earned a deserved reputation as leader in northcountry bush flight operations. Cold-weather operators of

180s and 182s soon learned that the airplane had to be flown with the carburetor heat on during the cold winter months and flown with a liberal use of heat the rest of the year to aid fuel vaporization when the carburetor air temperature was below 40°F. Moisture, sucked into the induction system during flight in rain showers, for example, cooled as it passed through the venturi and formed a nasty layer of ice on the throttle valve. In 1977 the Skylane instrument panel included a carburetor temperature gauge, a standard installation until the end of production in 1986.

Flying the O-470 begins with a thorough preflight. Unfortunately, much of what we might find interesting is hidden behind an unwieldy cowling. With the top half of the cowling off, we would look first at the condition of the U-shaped engine baffling. This rubberized seal should show signs that it has vitality and is doing the job of sealing the engine compartment so cool air coming through the intakes has nowhere to go but down through the cylinder cooling fins. We check carefully for rogue oil on top or around the engine block. My engine had always been a bit 'damp' with oil. Most of the oil was coming out of the oil filler cap, which, we eventually discovered, had a worn gasket. If the bottom half of the shell has been removed, say for an oil change, that's a good time to check for cracks in the carburetor air box and check the fit of the carburetor heat door. It ought to be snug and the seal intact and the door working smoothly. The flexible induction boot, which is connected to the carb air box and the induction filter box, is a very expensive part to replace, so we are careful to keep an eye on its condition. The air filter, of course, should be changed. If you still have a paper air filter, the manual says to change it every 500 hours. I used to change mine more often — at least annually. If you are using the STC'd Brackett 'sponge' air filter, see that it is clean and changed every 100 hours. While the bottom cowl is off we look at every inch of the

engine mount. To follow the mount is to take an interesting tour of the engine and visit places where designers meant to keep heat-sensitive parts shielded from the exhaust manifold. The exhaust manifold can produce enough heat to damage the engine mount, so you'll find heat shields propped up to protect it. Look under these shields for evidence of corrosion.

Then stand back and give the O-470 a real pilot's eye. Look for a straight rigging. A Skylane engine that sags has a problem. Check out the fire wall where the engine mount and nosegear attach. Any bowing or cracks or strange-looking bulges or bends ought to make you curious enough to ask an A&P to explain them. More than a few times my A&P has bit his lip and, with a flashlight, dove into the assemblage and found a problem.

When the cowling is on and we are conducting a walk-around preflight, most of us will peek in the oil access door and look through the air intakes behind the propeller. What we ought to look for, with a flashlight, is properly seated baffling — that is, baffling that seems to be folded toward the engine. We need to check that the oil filler cap is secure and that there isn't a lot of oil on the filler tube. There should be at least nine quarts of oil in the sump. My Skylane will blow anything more than 10 quarts out the breather, covering the belly after a few flights. The cowl flaps should be snug. If you can move the cowl flap side to side at all, it probably needs a new hinge and some snug rivets. If a cowl flap is loose, it doesn't open and close effectively; it flutters in the airflow, which creates vibrations in the cowling that loosen rivets and can actually create a vibration that you will feel sitting in the cockpit. A loose cowl flap is also a cowl flap preparing to depart the airplane. It costs about \$50 to put a new hinge on a cowl flap but about \$600 to replace it.

Flying an airplane is expensive. Most of us have winced when we have written big checks for small parts. It's hard for us to

believe that our Skylanes have more value in a parts bin than they do parked on three wheels, fit to fly. It was very hard for me to understand that I was ultimately responsible for every rivet on my airplane, and that every rivet, every doubler, every A/N bolt, diode and half-wave rectifier were dumped into my flying tool kit. For five years I simply flew my airplane and taxied into an FBO when things didn't work. I often flew away from FBOs with the same annoying problems and found myself trying another store. I bounced from shop to shop, spreading my frustration around. I got a lot of advice, spent a lot of money and bought a lot of new parts, and yet I had no control over my airplane.

One day I found an A&P who liked Skylanes. John Strand was a pilot/mechanic who not only respected airplanes, but had a great respect for proficiency in the shop and in the air. He took on 3135Q and me the way a small-town doctor worked a family, diagnosing the medical and psychological conditions as one. John believed that pilots could not be proficient until they understood their airplanes.

But how much do we have to know? FAR 91.3 says that as pilots we are directly responsible for, and the final authority as to, the operation of that aircraft. Our own burning need to control the airplane makes us feel uncomfortable when the airplane doesn't respond to our input. We land, get an audience with one of the guys in the shop and try our best to explain what it was that worried us. We don't do this very well, for the most part, and we could do it better if we understood more about the airplane and its systems. Even at that we are disadvantaged, because whatever the problem was in the air usually defies description on the ground. A kind of whumping sound can be a lean-running engine, an engine with an induction leak, a prop in need of overhaul or just a lousy choice of words. It's when we begin to think of an airplane as an assemblage of systems, some interdependent and

some independent, that we begin to take the airplane apart in our minds and see what it is that causes our Skylane to behave as it does. We can imagine a small quantity (one ounce) of fuel being pulled into the primer tube from the gascolator as we draw the plunger back. When we push the plunger forward we can feel the pressure of the fuel being forced into six small copper lines that spray the atomized gas directly into the intake manifold or directly into the cylinders, depending on the engine model. When the raw fuel combines with air, we have created a flammable mixture. To torch off this mixture we'll need a spark, and before we can get a spark we'll have to get some electrons flowing in the airplane.

Trying to understand an airplane electrical system should involve a simple review of the schematic. If you know anything about electricity, that's all there is to it. I didn't. I'd spent 20 years flicking switches and pushing buttons without any expectations. If things worked when I turned them on, fine. If they didn't, I had to bring someone into the problem to help.

One day I sat down with my A&P, John Strand, and he drew a diagram. John told me that an airplane electrical system is composed of three things. First, we need a source of energy, say a battery. The battery in my Skylane is a 12-volt, six-cell source with each cell producing 2.1 volts. We then need a way to conduct the energy somewhere, and wires or the aluminum skin of the airplane provides a low-resistance way to move electrons. Finally, we have to find some work for the energy to do, say to cause the rotating beacon to flash.

When we push the master switch to its 'on' position, we close a parallel circuit. Electrons depart the negative post of the battery and flow through the airframe of the airplane, energizing the master switch and a coil of wire in the battery contactor. The coil of wire creates an electromagnetic field that pulls a connector

down, makes electrical contact and allows large amounts of current to flow from the positive terminal of the battery to the rest of the airplane's electrical system. If we turn the rotating beacon on (closing the circuit to a light bulb, which has a filament, or as electricians would say, a resistor), the electron flow passes through the resistor, which slows the electron travel and causes the filament in the beacon bulb to get so hot that it glows. There is a voltage drop as the electrons perform this work, and the electrons continue their journey, at the speed of light, back to the battery where they return through the positive post. If we were to leave the master switch and the rotating beacon on and run into the airport cafe for lunch, the storage battery would spend energy, converting the energy stored in the battery to light energy in the beacon, and, depending on how long we spent in the cafe and the condition of the battery, we would eventually use up our source.

If we were smart and turned the master off before lunch, we will have enough energy in the battery to start the engine. The starter motor is the largest user of energy in our Skylane electrical system. A cold engine may draw as much as 400 amps to get the crankshaft turning.

This demand is tough on a battery that is rated to produce 35 amps for one hour. Because the starter motor demands such a large flow of energy, a large-diameter cable is required, and the cable should be as short as possible to reduce the loss of energy due to resistance. This has been an interesting problem for Skylane owners. Our 12-volt battery is located in the tailcone, just aft of the baggage compartment, about five and a half feet from the battery contactor. Five feet is a long haul considering the resistance encountered en route to the engine, and in 1978 Cessna introduced the 28-volt system to provide more energy at start-up.

When we turn the key from the 'off' position through the 'right,' 'left' and 'both' magneto positions to 'start,' we again

close a circuit that launches electrons from the battery's negative post through the airframe to the ground of the starter contactor, which energizes a coil and creates an electromagnetic field. This, in turn, pulls the connector down and makes electrical contact by closing the circuit to the starter motor. The electrons then flow through the starter switch and its circuit breaker in the bus bar and back to the positive terminal of the battery.

Meanwhile, the starter motor is turning a small gear on the accessory case behind the engine, which is geared to and therefore turning the crankshaft, the magnetos, the alternator and the vacuum pump. As the gears turn the crankshaft, rods connected to the shaft push and pull pistons in and out of cylinders and open and close valves that are timed by the camshaft to admit the fuel/air mixture. The timing cam lobes fire a magneto-generated spark through a plug to torch off the vaporous mixture, which burns rapidly and pushes the piston down (the powerstroke) and opens an exhaust valve. When the piston returns, it will force the burned gases out into the exhaust manifold, through a heater muff and, finally, out the exhaust stack.

Once the calliope of pistons and valves and magnetos and rods and cam lobes and plugs begins moving by the power of combustion, we release the pressure on the key and the starter circuit opens. Powered by a crankshaft gear-driven belt, the alternator begins producing an alternating current, which is rectified to direct current and comes on-line as the principal source of energy. The voltage regulator organizes the level of current in amps, not volts, which will be required by the system. The alternator and the battery, which stay on-line, provide the alternator with an electrical field and produce electricity for the airplane.

The electricity in the airplane surfaces on a bus bar where everything that uses power is represented by a circuit breaker. The bus, as they say, is also connected to the positive terminal of the battery and carries just a bit less than 12 volts or, after 1978,

28 volts. The bus bar may be split. In my 1967 Skylane I have a primary bus that is the terminus for all the electrical components except the radios and beacon, which terminate on a separate electric bus. The two bus bars are connected by a split bus contactor, which is normally closed. In newer airplanes, the second bus is often switched by an avionics master that is connected to the main bus.

When we turn everything on, say during a night flight with pitot heat, and experience an alternator failure en route, the battery is suddenly responsible for the load. We can easily determine how long the battery will support the existing load by adding up the amps of the equipment we have on-line. If we have a brand-new battery in good condition, we may have close to 35 amp-hours available. That means that we could run one nav/com (5 amps), the transponder (3 amps) and a GPS (7 amps) for two hours, although many experts seem to think that a pilot ought to deduct 50 percent of the battery's capacity for this planning. It's a logical idea. We may have had a slow start and drained some battery amps or we may have a cold battery, which reduces its efficiency. A plate in the battery could be damaged, or the electrolyte could be low in a couple of cells.

Take away 50 percent of the amp-hours and we have an hour to get on the ground with one radio, a transponder and a GPS. If we're flying on instruments at night, in the goop, in icing conditions, we should know how many amps each component draws, and we should know before we launch what we'll turn off if we lose the alternator. We can lose the battery too, although it's rare. But say we inadvertently turned the master switch off. We have removed the 'field' from the alternator, and therefore our source of electricity. The lights will go out, the radios will fade and the flaps will stay up. If we discover the problem and turn the master on, an electrical field will return to the alternator and we'll be back in business.

## Chapter Six

When Antoine Saint Exupéry departed Paris on December 29, 1935, launching his ill-fated flight to Saigon, he flew out over the Mediterranean Sea and spotted a stream of fuel venting from his left wing.

“Prévo!” Saint Exupéry screams.

Prévo, the mechanic, leans into the cockpit.

“Look! Isn’t that gas?” Exupéry asks. “Seems to me it’s leaking pretty fast.”

Prévo checks the gauges and agrees. They turn back, land, fix the leak and refuel. And off they go again, Exupéry at the controls, Prévo at his side.

Prévo lights a cigarette for Exupéry.

“Coffee!” Prévo fetches a thermos and pours coffee for the famous pilot.

After dodging rain squalls Exupéry looks back at Prévo and says, “We’re over the worst of it. This is fine.”

“Yes,” Prévo says, “fine.”

Later, Prévo makes a sandwich for Exupéry.

The pilot writes: “I was not hungry, I was neither hungry nor thirsty. I felt no weariness. It seemed to me that I could go on like this at the controls for 10 years. I was happy.”

How could Saint Exupéry not be happy? He's got his A&P/nanny, Prévot, doing all the work.

Pilots can be weird ducks. We work hard to earn our wings so we can savor the freedom to fly. Yet in the bad moments, when the stakes are high, when solving a problem ourselves could give us the very freedom we have been searching for, we are more than willing to give our responsibility away.

One summer night several years ago I was flying home to Minnesota from the East Coast. I stopped in Indianapolis for fuel and a sandwich. While I was eating, I gave Flight Service a call to file a flight plan and get an update on the weather. Earlier that day, when I gathered the weather from a DUAT terminal in Virginia, I had been surprised that thunderstorms were not in the forecast for the Midwest, considering the heat and the moisture at reporting stations along my route. There was a low pressure center in western Kansas at 1200Z, but its movement appeared to be blocked by a high on the East Coast and another in Texas. The forecast for my seven-hour flight westbound was thunder-free, and I would enjoy a flight at 6,000 without strong headwinds. The highs were forecast to move during the night, and the low would begin to move across Kansas eventually, pumping Gulf moisture and convection across my route. Of course, I would be home and in bed by then.

But as I approached Indianapolis my groundspeed slowed, and I couldn't figure out why until the Flight Service briefer asked if I would be able to continue my flight from Indianapolis IFR. He told me that a line of thunderstorms was moving north-east out of Iowa along a weak cold front that crossed my route through central Wisconsin. I put my sandwich down and found a pencil and a piece of paper. The low pressure center was moving, which explained why my groundspeed had deteriorated.

Then I gave my responsibility away; I asked the question:

“Does it look like I can get around it?”

How is he supposed to know?

That question, like many of the questions we impulsively ask of ATC and Flight Service, our mechanics, airport managers and line technicians, shows just how fast we are willing to give up the helm, get out of the wheelhouse and become passengers. Once when I had trouble starting my airplane a hundred miles from home, a mechanic told me that I needed new spark plugs. I said, “Well, yeah. Hmmm. Do you think I can make it back to Minnesota?”

Hey, who’s flying this thing?

The mechanic had looked at my engine and given me his opinion that my spark plugs were bad enough to require a fresh set. The Flight Service specialist had given me a briefing. He told me what was forecast to happen in my little slice of the atmosphere. Neither of these experts was in a position to reach out beyond his field and make pilot-in-command decisions. When we received our certificates to fly, we were given the responsibility to safely engage our new freedom. We may all have been told, as I was, that our certificates were learner’s permits, that with common sense and experience we will eventually attain a level of judgment that will allow us to learn even more. In the meantime, as we learn, we are certificated as commanders of our flights. The decision to fly is ours alone.

In 1994 the Aircraft Owners and Pilots Association published a safety review of the Cessna Skylane and found, not surprisingly, that 80 percent of the accidents that were reviewed for the report were caused, in one way or another, by the pilot. Whether the pilot made a bad decision, exercised bad judgment or simply quit the wheelhouse when there was trouble, the airplane got bent, people got hurt and some died. “Although the Cessna 182 is a benign, honest aircraft,” AOPA said, “the individuals flying them generate most of the mishaps.”

I stood on the ramp at Indianapolis, looking at the stars in the western sky, and reasoned that I could head for home. I thought I would fly the route as planned, check the progress of the thunderstorms and land somewhere if necessary. I hurried the pre-flight a bit, checked that I had full fuel, picked up my clearance and took off on the first leg for Peotone VOR, a 115.7-nm flight that was as serene and enchanted as any night flight I have had since. The beautiful skies and smooth cool air were refreshing after a stuffy layover on the humid ramp at IND. I could see forever too, following the strings of lights from country village to the aurora itself, Chicago. While I was admiring the earthly jewels of civilization, the chatter on the Center frequency was increasingly focused on a line of thunder just south of Lone Rock. A couple of Beech-18 cargo pilots were poking around on the west side of the line. "Doesn't look that bad from here," someone said. I looked to the west as I passed Chicago heading for Rockford. Nothing. Smooth flight, excellent visibility.

But something was happening to me. I was becoming edgy; my mouth was dry. I was as uncomfortable as I have ever been in an airplane. I couldn't put my finger on what was wrong, and I didn't care. I just wanted to go home and sleep.

A half hour later, just south of Madison, Wisconsin, I saw the western sky light up. I winced. I told Center I would be off the frequency for a few minutes, and then I called Flight Service. The specialist told me that the line was filling in from Dubuque to Lone Rock and moving east. I ought to be north of the line in 30 miles, in moderate rain for another 10 miles and then, if I stayed east of Minneapolis, I would fly in light rain all the way home to northeastern Minnesota. A Piper Cherokee passing Eau Claire, Wisconsin, at 4,000 reported light to moderate turbulence in rain. An airport near my homebase was reporting 5,000 broken, rain showers and seven miles of visibility. I checked back on with Center and thought it over, watching the distant lightening.

What I thought about, as I recall, had very little to do with flying the airplane. I considered landing at Madison, and my mind played through the routine of getting the airplane in a hangar, finding a motel room, getting transportation, calling Jeanne. Then I thought about Jeanne and I looked at my watch. I was already an hour behind my schedule. While I was 'thinking' I lost a few feet of altitude and found that I had turned 15° away from the lightening. I made the corrections — and then some. I corrected again. I was becoming the picture of a pilot who had given up command. I was tired after six hours of flying. I was tired because it was night. I was wary of the fairly anemic weather because I didn't really know what was going on. I hunkered down and consciously flew on instruments for a time, but my lips were dry, and when the first wave of rain hit the windshield, I was startled. I was a burned-out pilot.

"Prévot!"

Anders Christenson, an FAA-designated examiner, a former high school teacher and veteran floatplane pilot, told me once that there is no such thing as 'burnout.' "Just think," he said, "about the high school teacher who comes into the profession, young and full of vinegar, eager to do good stuff. Then, after a few years we hear that he quit the job and is out selling insurance somewhere. We hear that he 'burned out.' I don't believe that," Anders said. "People don't burn out, they become disappointed. They exhaust their professional reservoir on problems for which they have no information, so the problems remain. People work day and night to achieve worthwhile ends, but without the correct data they come to no conclusion. They become disappointed, but they say they have burned out."

Pilots, according to Anders, don't burn out when the going gets tough, but they do become disappointed and quit. And they quit because they can't think of anything more to do. They wear themselves down and out doing the wrong things, thinking about

things that are not really a part of the problem, and, finding no solution, they quit.

“The proficient pilot,” Dave Moran told me, “is the pilot who has alternatives.” Proficient pilots are seldom caught without enough information because they take flying seriously enough to learn everything they can about their airplane, about the flight environment and about themselves. They learn about the limitations of the airplane and the limitations of the environment and they come to know their own limitations. “Pilots who are proficient are living in a state of optimism,” Moran says. “They are so comfortable with the idea of problem solving and so familiar with the tools of their trade that a crisis on a dark and stormy night is just another problem to be solved. They can be frightened — their knees will quake just like yours or mine — but the real problem is something that they can identify and work to solve. They are not distracted by failure. Look at most any airplane crash and you’ll find that the pilot either didn’t know the limitations of the airplane, didn’t understand the flight environment or didn’t know or respect his own experience.”

Aviation bureaucrats are very much aware of the ‘pilot proficiency problem’ and the role it plays in accidents. The authorities have become a bit disappointed themselves that training programs have not ended aviation accidents once and for all. Proficiency, to a bureaucrat, is quantifiable; if it wasn’t, he wouldn’t have a job. So we live with government mandates to maintain our proficiency by taking checkrides, flight reviews and recurrent training. We sit down with an instructor and review the regulations, we attend day-long workshops and seminars on meteorology and we fly with an instructor and demonstrate our ability to perform certain ‘proficiency’ maneuvers. We study up on the regs and we fly out to the practice area to work on our proficiency. When we have satisfied the regulatory requirements and get the nod from a check pilot, we say we are proficient.

Sometimes we fly away from our seminars and hit the side of a mountain, even before the authoritative ink is dry in our logbook.

"Proficiency is an attitude," Moran says. "It's a way of life for people who have discovered the pleasure of learning. You are either committed to learning about your craft, or you are willing to adjust your limitations to reduce your exposure to eventual disappointment."

Over time, and especially after a sweet landing or a successful cross-country flight, we think of ourselves as proficient. Then one day ice covers the windshield, we lose the runway during a routine IFR circle to land or the engine quits on takeoff, and we don't feel proficient at all. We can be frightened, and we are certainly disappointed. But what happens next determines whether or not we are pilots.

Every pilot safety seminar includes the advice: Fly the airplane. And everyone agrees. But suppose we don't know how to fly the airplane. Suppose, for example, that we have made a full-flap approach to a runway in our Skylane and we are just about to touch down when a deer steps out onto the runway. What do we do? If we land we will hit the deer. We must go around. With full power and full flaps, what one airspeed will give us the climb that we need to avoid the deer? There's just one speed that will give us maximum climb in a Skylane. If we climb 10 mph less than that speed we lose 100 fpm climb; likewise, if we climb at 10 mph more than that speed we lose 100 fpm climb. In other words, if we do something other than the right thing, we will hit the deer.

The full-flap, full-power climb speed is a number to memorize, but it is also a number that changes with the density altitude and weight of the airplane. The full-flap maximum climb speed is 70 mph at 2,800 pounds and a density altitude of 4,000 feet, and it will give us 400 fpm climb at full power. That magic num-

ber will decrease as the weight of the airplane decreases. Getting the most performance out of our Skylane suggests that we need to be aware of our airplane's weight at any particular time during a flight. We can find these numbers by experimenting, writing them down and reviewing before we take off.

My Skylane is at gross weight when I have 65 gallons of fuel on board (390 pounds), three 180-pound people (540 pounds) plus me (170 pounds). I am not likely to be landing with full fuel, so let me take these people somewhere and burn an hour and a half of fuel out of the tanks before landing. At 14 gph, I'll burn 21 gallons or 126 pounds off my gross weight before I start my approach to a runway at 4,000 feet density altitude. My Skylane weighs 2,640 pounds on this approach, which changes my full-flap, full-power climb speed to 68 mph. Okay, I miss that deer, and now I drop the passengers off and fly home, burning another 126 pounds. Alone in my 1,700-pound Skylane carrying 138 pounds of fuel and me (170 pounds), 35Q weighs 2,008 pounds on approach. Another deer steps out and I climb at ... ? 59 mph. Does 10 mph really make a difference? Try it and you'll find out it does — about 100 fpm.

We'll be using a formula for this computation soon, but the basic idea here is that we need to understand the limitations of the airplane before we can use it effectively. The operating principle in this case is that as airspeed increases, so does drag. If we try to escape the runway in a flaps-down, go-around condition and pitch up to what we *feel* is a safe airspeed, say a familiar pitch angle on climbout like best rate, flaps up or 90 mph, we will go faster, produce more drag and lose climb capability. If we simply panic when we see the deer and jerk the controls back, the sheriff is likely to have venison for supper, and we'll be eating hospital food — if we are lucky.

Proficiency isn't all numbers. Like Moran said, it's an attitude. A friend of mine recently departed his home airport in a

Beech Debonair and heard a clunk-snapping sound as he lifted off the runway. He continued the climb, checked the gear and found that the nosewheel had not indicated up. Bob is a 12,500-hour professional pilot who flies business jets for a living. Over the years he has been restoring a 30-year-old Debonair, and he knows the airplane's systems very well. When he heard the 'snap' he 'flew the airplane' and then reasoned that a nosegear rod end had failed. He told me he could 'see' how it must have failed. Now all he had to do was fly the Debonair somewhere, try to get the gear to come down, land and get the maintenance done. During the next hour of flight, Bob had time to plan. He picked an airport that had the maintenance he would need, a runway large enough to handle the maneuvering he anticipated and crash equipment. He told the tower about his problem and then flew east of the airport to try to shake the nosegear down. He reasoned that the nosegear rod end could be slung into the wheel well and wedged there. He tried to do this by pitching the nose up repeatedly. When he thought he had wedged the rod in place, he flew to the airport and made a power approach, shutting down the engine over the numbers and, with the starter key, turning the prop to a horizontal position. He held the pitch, landed on the mains and allowed the airplane to settle on its nose. The nosegear rod was damaged, but it held the airplane up.

As long as I have known Bob Ericksen, he has been a prophet of proficiency. When I have flown with him he has demanded irritating precision. For a time I was using 10° of flaps for my takeoffs, assuming that I was getting up and out of the airport environment more quickly. Bob told me to read the manual carefully, experiment and let him know what I found. A couple of weeks later I reported back to Bob and told him that 10° of flaps shortens my ground run by 20 percent but costs me in climb performance. "The real penalty comes when you add work load just after takeoff," Bob said. "If you are departing into IFR condi-

tions, you don't need the extra work." He also asked me if I had ever forgotten to raise the flaps when I got busy after takeoff. I had. Case closed.

"Not quite," Bob argued. "There are times when you need the lift authority of 10°-20° flap setting on takeoff. The pilot must know when the time and the conditions are right and consider the use of flaps another maneuver that needs practice. Be positive in an airplane. Know why you are doing something or don't do it."

Though it startled me at first, the drumming rain calmed me down eventually. After another weather briefing with Flight Service, which confirmed that the thunderstorms were moving along a line to my west but some distance from my line of flight, I found that I was regaining my confidence and sitting up straight, flying by instruments, actually beginning to enjoy the night flight again. It was a beautiful night and the air, just then, was smooth like the surface of a lake at sunrise.

I had been out of the loop that exists between a pilot and the airplane and the environment for a half hour, and it showed in my performance and on my shirt, which was soaked with sweat. I came back into the picture by taking action, by getting a weather briefing that not only confirmed what I was seeing outside, but took me forward to have a look at where I was going in time and in space. I asked questions of Flight Service that painted a picture for me from my present position to my destination. I asked for reports to my west and forecasts for my small tunnel at 6,000 feet that would take me home. Pilot reports confirmed the forecasts, and my own groundspeed and ride confirmed the pilot reports.

When the weather forecasts are confirmed and the atmosphere begins to make sense, we can fly in some pretty awful stuff and be comfortable. It's when there is chaos in the reports and forecasts, and when our flight experience doesn't match the briefer's

view of things, that we sit up a bit taller in the seat and recognize that we have a problem to solve.

Sometimes, alone at night, especially in the clouds or during that magical moment when I break through the tops into a moonlit sky, I look around in the airplane and swear that I've got passengers. There's Dave Moran napping in the right seat, Bob Ericksen behind me, reading a newspaper, and Anders, watching me with a puckish smile. These men, and many more like them, have been a part of my flying life. Like Prévot, they have given me a cigarette, they have poured coffee, and Bob Ericksen once bought me a sandwich. Unlike Prévot, they have never taken the responsibility from me, but, on the contrary, they have taught me that the responsibility to fly an airplane, to know an airplane, is mine alone. These veterans have taught me that the expensive pleasure I seek when I fly will come only when I learn that proficiency is a lifetime pursuit. "You'll never know it all," Jim Tompkins used to say. "That's why we fly — to learn."

When the lone drone of the engine seems to fade away and I find myself mesmerized by the empty night sky, Bob hits me with the newspaper. Dave wakes up when he hears ATC calling 3135Q, and he hits me on the shoulder and points to the radio. Anders watches it all, smiling, and then suddenly leans forward: "You see, Richard, flying is a state of relaxed concentration. We promote ourselves from the job of handling the controls to a management position. We watch and we listen for good rhythms. But good rhythms can lull us to sleep!" Anders laughs. "Isn't it curious that when we are doing the best job, we are so close to doing nothing at all?"

And the engine drones on, the transponder reply light flickers, the rain streams along the windshield. A flash of lightening to the southwest confirms my understanding of tonight's environment. ATC comes to me softly and I change frequencies, check on with

the new sector and scan the engine instruments. Each needle is working on the job I have assigned to it: 21 inches of manifold pressure, 2200 rpm. An exhaust gas temperature of 1450°F, carburetor temperature of 20°C. A fuel burn of 14.1. Oil temperature, oil pressure and cylinder head temperature needles are all pointing straight up. Just where they should be in my airplane when things are working well.

The Cessna Skylane is a big hunk of an airplane that is quite easy to manage, but it can be a bear to fly when the pilot is out of phase with the airplane's aerodynamic needs. When we learn to manage the pitch and power settings to achieve a certain level of performance, the flying is easy and enjoyable; but fight the heavy pitch forces and mismanage the power and we are in miserable shape, totally unprepared for the unexpected. It is the unexpected that tests our understanding of the airplane. It's the first nibble of turbulence, for example, that reminds us that there is a certain speed at which the airplane will ride comfortably and we should begin to power down to that speed. Our mind computes the total weight of the airplane and then quickly computes the additional load caused by the turbulence. My airplane manual says that when I am flying at gross weight, the maneuvering speed of my 1967 Skylane is 128 mph. When my airplane weighs less than gross, it is subjected to more vertical acceleration from the bumps than it is when it is heavy, so I need to reduce my speed even more. How much? At 2,100 pounds, maneuvering speed for my Skylane is 110 mph. To fly my Skylane at a higher airspeed than 110 mph in turbulence, at 2,100 pounds, invites overstressing the airframe. I probably will not break up in flight, but over time I will see evidence of this stress on the wing structure, control surface hinges and flap tracks and attach points. The skin of my Skylane will show its age more quickly as rivets loosen and smoke.

As I bump and yaw into the first layer of turbulent air, I pitch the nose up, aiming for 110 mph, and back the throttle off until I have stabilized at the new airspeed.

Actually, it is easier than that. We can know the numbers, the pitch and power numbers, so when we pitch up 5° to achieve a 20-mph reduction in airspeed, we reduce the manifold pressure by five inches. Then we trim — not short jabs until the control wheel pressure goes away, but we turn the trim wheel by grasping it at the top and rolling it down to the bottom, smoothly, one turn, nose up. We count the turns. In my airplane it's one turn of trim for every five inches of manifold pressure, nose up or nose down. It works every time.

All airplanes have combinations of pitch and power that will produce a specific performance. A J-3 Cub works that way and so does the Concorde. But airplanes react very differently to pitch and power inputs. Our Skylanes have what a Bonanza pilot would call ponderous controls. We really have to move the controls to make something happen, and then it doesn't happen quickly. In a Bonanza, if you just think left turn, you're turning. The Bonanza 'feels' aerobatic compared to our 182 truck. Our heavy control force is our payment for a superbly stable airplane. Ask a Bonanza pilot how his controls feel on a thundery, bumpy night, slip-sliding down an ILS.

I once told Dave Moran that all this number flying stuff was great for instrument work, but what about those sunny summer days when you're loping cross-country, down low, enjoying the river valley with friends? Doesn't number flying take all the fun out of it?

Dave smiled. "Can you ever remember having fun in an airplane when you weren't in control? Have you forgotten what it felt like to screw around with the trim tab for the first half hour of a cross-country? Was it fun when you wondered whether or

not the Skylane could get those three big guys off that hot runway into the air? Wouldn't you have liked a number the day you aimed 35Q for that alfalfa patch?"

## Chapter Seven

They say there is so much paperwork in aviation these days that every time an airplane takes off a tree dies. But paperwork is a reality of our flying life, just like low ceilings and rain and wind, so we make a plan, create alternates, pull the seat belt a little tighter and ride it out.

The paper that gives airplane owners the most trouble is located in three places: We carry our certificates and ratings and medical certificates in our wallets and handbags. We should take these documents to a copy machine, reproduce them and file a clean copy in a safe place. If we own a Skylane or if we are in charge of one for a flying club, we have a portfolio — usually a stuffed, cracked, vinyl case — that contains our airframe and engine logbooks and a lot of other things like letters and invoices and loose papers and random data. We have some Cessna Service Bulletins and letters and pictures and odds and ends, some of which are in our desk, some in the kitchen cabinet and some in the airplane.

In this chapter we are going to make a plan to organize the paper. We are going to make bureaucrats so happy they'll probably froth all over themselves, but, in the end, it will make us happier too. And when it comes time to sell the airplane, we will

have increased the value of our property.

What we want to do first is get all of our Skylane's paperwork in one room, sort it out, preserve some crumpled bits and build a portfolio of important stuff. Later we will build a small notebook, our flight book, which will contain all of the important numbers for our Skylane.

We are going to go out to the airport and get everything out of the airplane, but first, let's stop at an office supply store and buy these things:

1. Two large, strong garbage bags.
2. One standard, full-size, three-ring binder that is enclosed by a zippered, cloth-covered notebook. School kids have them; they are like three-ring notebooks except they have rugged covers and zippers that enclose everything. If there are pockets inside the binder, good; we'll use the pockets.
3. Two packages of three-ring page dividers.
4. One 8- by 10-inch Manila envelope.
5. A very sturdy 6- by 9-inch or 9- by 7-inch three-ring notebook binder with some blank paper, plastic pockets and page dividers. This will become our flight book.

Note: I broke down a few years ago and bought a one-inch, real leather Jeppesen approach plate book to use as my flight book. I did that because I use *Jeppesen Airway Manuals*, and whoever makes these binders for Jeppesen makes them well and they last forever. This book is going to have everything we know about our airplane in it, and it is going to go with us everywhere. It'll get wet and oily and full of coffee stains, so it will pay to buy a sturdy binder. If you order the Jeppesen one-inch binder, get some chart tabs, approach plate pockets and a pack of Jepp navigation logs. Then take one of the Jeppesen pages to a printing shop. Tell the people at the printing shop that you want to buy a ream of 24-pound laser paper and have them cut it in half so that you end up with 1,000 5 1/2- by 8 1/2-inch pages. Ask if they will

drill holes in the 1,000 sheets using the Jepp page as a pattern. The holes should be the same size that Jepp uses. Bring your Jeppesen binder with you when you pick up the work and make sure that the pages fit nicely.

6. A huge bulldog clip, and three large rubber bands that can go around the notebook.

7. A three-hole punch large enough to make standard holes in an 8 1/2- by 11-inch sheet of paper.

8. A 5- by 8-inch pad of yellow paper.

9. Two large canvas bags.

At the airport, we'll open the airplane and take all the loose stuff out of the cockpit and the baggage compartment. The works. We'll take the contents of the glove box and the side pockets, the charts under the visor and the headsets. Take the GPS and anything else that's Velcroed to the panel. Get it all.

If your airplane is anything like mine, you will need both large garbage bags to do this. We're going to fill the bags up with the stuff that's under the pilot's seat and in between the seats. We'll empty the pockets behind the front seats and get down under the back seat and pull all that out too. There'll be tie-down ropes and stakes, your missing fuel sampler and a couple of out-of-date NOS charts, some rags, maybe a few airsick sacks — hopefully unused. Let's put that stuff in the bag. We'll fill the second bag with everything that's in the baggage compartment — all of it.

Next, standing at the left door, we will study the papers that stay in the airplane. There are three separate papers, and they should be in a plastic pocket, probably on the side panel down by the left rudder pedals. We will take the papers out, look at them and put them back. There will be an Aircraft Registration, and it will be made out in your name, your company's name or the club's name. If the registration isn't made out to a name that you

recognize and you are looking in the right airplane, you'll have to call your local FSDO office to get that fixed. Then we'll look at the Airworthiness Certificate. This document stays with the airplane at all times, even if you sell it. The Airworthiness Certificate is the airplane's birth certificate. The name and the serial number and the 'N' number of your airplane will be on this certificate. If the registration or serial numbers do not match your airplane, you might want to call AOPA first to get that fixed. The radio station license will have your name, the club name or a familiar name, and it will show when you received your license to broadcast from the airplane and when it expires. The Federal Communications Commission is the regulatory agency that will get worried if your certificate has expired. The FAA has no jurisdiction to worry, but if you were ramp-checked by an FAA inspector and the certificate was not current, the airplane would not qualify as airworthy. All right, put these papers back in the side pocket and let's go home.

Before we do anything else, we will weigh the bags on the bathroom scale and write the weights down. The stuff from the front of the airplane weighs some number, and the baggage compartment things weigh another. Write those numbers down and ponder for just a moment. When you worked a weight and balance for your airplane, did you include this weight? Please keep those numbers; we'll need them later.

Let's find a room where we won't be disturbed and where we can open the bags and dump the stuff from the airplane out on the floor. Bring the vinyl portfolio with the logbooks into the room, and all the loose airplane stuff in the kitchen cabinet and your desk.

We will make three piles: One pile we will call '91.417'; one pile, 'history'; and a pile called 'stuff.' We won't make a pile called 'trash' because we don't want to throw anything away — yet.

The most important pile is the one we've labeled '91.417.' This is the FAR that outlines what maintenance records must be kept by the owner. Your Skylane may be the best-equipped, smoothest-running, most well-maintained airplane in the fleet, but without complete paperwork, logs, records, supplements to the type certificate, AD compliance and records that attest to work performed, your airplane has diminished value. What we will do first is collect all the required documents and install these, and our logbooks, in our new zippered notebook.

The easiest way to set up the zippered notebook is to start at the beginning. Find the dividers and make these titles:

1. Weight and balance. This will be the first section of data in your notebook, so find all the documents that say 'Weight and Balance,' or 'Revised Weight and Balance,' and sort these out according to the date, the latest entries on top. What you will be looking for are papers from, say, an avionics shop or an FBO that has done some work on your Skylane. They may have installed a new radio or removed an old power supply from the tailcone. When they did this work they changed the weight and balance, so they recomputed it and superseded the previous computation. We want the most recent data on top. Look for the original 'Weight and Balance and Equipment List' and include this sheet at the very bottom since it was issued with the airplane. The top page, then, has the most recent numbers. My Skylane's top page says: New Aircraft Empty Weight: 1,738.1; New Aircraft Center of Gravity: 35.12; New Aircraft Useful Load: 1,061.9. These are the numbers that I use to compute weight and balance for my trips. Every time the shop added or subtracted avionics from your panel, installed the ELT in the fuselage or removed the wheel fairings, they first determined whether or not the removal or the installation would affect the weight and balance of the airplane. The shop tech who made this sheet up went through all of your paperwork and logs trying to find the last entry so he would have

some numbers upon which to base the new figures. If the weight and balance data is in error, all the updates that follow will be in error. It will be likely that someone forgot to deduct the weight when the wheel fairings were removed, but added the weight when they were re-installed. Or perhaps an owner removed an old Narco Mark 12A radio and the 3.9-pound power supply in the tailcone and he made no entry in the logbooks. Years go by and the airplane is sold and a new owner has an avionics shop redo the panel. Even though the shop techs may be the best, they will base the revised weight and balance on data that has been corrupted. The only way we will get it all straightened out is to take the airplane to a shop where they can weigh it. If you do that, you will have a new top page in your notebook.

2. Airworthiness Directives. Look through your piles of paper for something called 'AD Notes Compliance Records.' This should be a list of all the ADs that have been issued against the Skylane. A thoughtful A&P may have made this list for your airplane and written down all the AD numbers, the subject of the ADs, the date on which the compliance was signed off, the method of compliance, whether it is a one-time AD or recurring, the next compliance date and a place for signatures. FAR 91.417 says that the owner is responsible for the status of all AD notes, so if you don't have a registry, you might want to have your A&P make one up. The record of AD compliance may be in your airframe or engine book, but the AD Notes Compliance Records gives you quick access to the AD status of your airplane.

3. Alterations. You will find pages for this section titled 'Major Repair and Alteration' or, as the A&Ps call it, 'Form 337' or 'a 337.' This document is the paper backbone of everything that has legally been installed in or on your Skylane since it was new. These are additions to your airplane that are authorized under its type certificate. You need a 337 when you add radios or a new panel-mounted GPS; a 337 is required when you add a

strobe light or antenna. The shop will probably put a note on the 337, advising whether or not the weight and balance was affected. You will then find, we hope, a revised weight and balance form referencing this 337. Arrange them so the latest 337 is on top.

4. Supplemental Type Certificates. This is FAA Form 8110-2. You'll find these papers tucked into the vinyl portfolio with Skylane logs. The Supplemental Type Certificate is the STC that we hear so much about. You may have an STC for auto fuel, for a fuel flow meter or for any modification that requires approval to be 'installed' on your Skylane's original type certificate. You may also find that there are many pages of instructions and diagrams and electrical schematics that seem to be lost in your vinyl portfolio. See if you can match these lost bits of engineering to a Supplemental Type Certificate and include them. Some A&P trying to troubleshoot a 10-year-old carburetor temperature probe may save you many shop hours by referring to the data you have organized. Then arrange the whole section so the last STC reads first in your book.

5. Form 8110-3 or Statement of Compliance With Federal Aviation Regulations. These papers should exist, for example, if you have had a new interior installed and the shop had the materials flame-tested. If your mother-in-law did the interior of your Skylane, using remnants from her remarkable living room set, you'll have no fire testing report, but you may have an exciting fire someday. No fire test, no Form 8110-3, and you may have to pay for that when you sell the airplane. If you find an odd piece of carpet or side panel in the big pile, by the way, it was originally attached to one of the fire test forms.

6. Work orders and invoices. This is a section for the garden-variety shop work: an oil change, a pitot/static system check, a list of parts that were used when the A&P rebuilt your nose strut. Arrange them historically, the most recent first, and think of this

section as an interesting reference to the expensive past. As your book gets full, move the aging documents from this section to the history box. The real value of this section is quick access to recent maintenance data. When did I get an oil change? What was the tach reading? The work and the date of the maintenance should be in your logbook, but in this section we can find part numbers, phone numbers and costs.

7. Advisories. Here you can store all the advisory and service letters that you will find kicking around in your vinyl portfolio, your desk and in the kitchen junk drawer. Cessna's suggestions are very much worth a review with an A&P, but they are not regulatory. You will get these advisories in the mail from time to time, and most of us stuff them into the vinyl portfolio and forget to ask about them. If you have them punched and in your notebook, you can tell the A&P to check out the 'service letters' in the back of the notebook when he starts an annual inspection.

8. Yellow Tags. As you dig through the main pile, you may run across small tags that say 'Maintenance Release.' Some of these tags are actually yellow, but A&Ps call all maintenance release tags 'Yellow Tags.' Put them in the Manila envelope and write 'Yellow Tags' on the envelope. These tags are the legal maintenance release forms for, say, your new cylinder, overhauled altimeter or prop repair. You will also find many of these tags stapled in your logbooks. Leave them there. In fact, anything stapled to your logbooks ought to stay stapled. If you really have time on your hands someday, you can sit down with an A&P and reorganize your logbooks.

Now find all of your airframe and engine logbooks. You should have an airframe logbook, or two, depending on how old your Skylane is. My 1967 model has two airframe logbooks, and I'm getting close to needing a third. Real hangar queens can have five or six logs. And you should have an engine logbook or two.

The airframe logbooks are very valuable and they stay with the Skylane for life. Your engine logbooks are valuable too, but they stay with the engine. If you decide to buy another engine, you will get that engine's logbooks. It's a good idea to check the serial numbers of the airframe and the engine and see if they match the serial numbers in the logbooks. Shops are very good about getting the right logs back to the right owners, but stuff happens, and you are the one who is, as the FAA says, 'ultimately responsible.' If you still have the logs to a previous engine, then somebody else has a problem tonight.

Before we put the logbooks away, let's take them to a copy machine and make two copies of the works. Copy every page of the airframe and engine logs. You may have to lift up the Yellow Tags and stapled papers to read the log page. When everything is copied, make two sets. One set should be kept in a very safe place, like a bank vault. If you should ever lose your engine or airframe logs, or any of the permissions or tags, say in the event you had a house fire, you have excellent proof that the airplane has logs. Without the logbooks your airplane's value is greatly decreased. Without evidence that you have a 'proper weight and balance' or a proper track record of alterations, selling the airplane will be a major hassle. So make one set for the vault and one set marked 'history box.'

The original logbooks should be kept in your zippered notebook. Never store your zippered notebook in the airplane. Keep it at home or in the office. An airplane's paperwork is extremely valuable. Bad guys can steal logs and use them in nefarious ways, which will soon be traced to you. Bad guys steal airplanes too, and if you have left your logs aboard they have a much easier job of unloading the goods. When you give your original logbooks to the shop to have some work done, get them back before you fly away and be sure that what you get back is complete and belongs to your airplane. If you have a deal with your A&P and

he keeps the logs for you, fine; just remember that he is caring for about one-fifth of the value of your airplane. If he has a fire or a brief moment of irresponsibility and your logs get lost or destroyed, you lose.

Put your logs in the pockets of your zippered notebook.

Make sure everything is out of the old portfolio. You'll have to look inside because some things will stick to the vinyl.

If you have a 10-year-old airplane and it's had a busy little life, your three-ring notebook will be bulging. What we'll do now is create a place for the rest of the papers on the floor.

You may want to pour another cup of coffee for this job, because you'll want to look at each and every piece of paper. There may be something with a signature on it, or a small card that a shop has used to write down the data for a pitot/static system check. Look first for anything that you may want to add to the zippered notebook, and the rest of it you can put in the history pile. You may want to do a little editing of the history. You might find correspondence between an insurance company and a former owner. Good historical stuff. Fix the folded corners; staple an envelope to it if there's an address or the name of an owner on it. There may be fuel receipts or work orders that you collected a few years ago when you bought gas on your way to Florida, or an invoice from the shop where you had your alternator repaired. Good history; preserve it. You will probably find little bits of paper, some old pieces of rubber band and ripped bits of paper. If nothing is written on these bits, and they do not recall for you some past love or sacrifice, you can throw them away.

Find a sturdy box and label it 'History: Skylane N\_\_\_\_\_'. Some rainy day in the future you might want to organize the stuff, include some pictures of you and your airplane and a map of your travels. This is a good place to keep Skylane articles that you have cut out of magazines. Eventually, if you decide to sell the airplane, use it to charm a prospective buyer of your Skylane.

So much for the paper. Now we still have a pile of bigger things to sort out. I took one look at the pile I made in the living room and went right out and bought two canvas travel bags. I put tie-down ropes, anchors, a pliers, a set of screw drivers and a really good needle-nose pliers, along with a 10-year supply of duct tape, Band-Aids, some matches, two rolls of paper towels (Bounty) and some leftover Oshkosh pocket raincoats into one bag. I zippered it shut and weighed it. When I got over the shock that it weighed 25 pounds, I wrote that number on a tag, which I tied around the bag's handle. In the second bag I built several divisions so I could feel comfortable about keeping an extra headset and an extra microphone in close quarters with a flashlight and fresh batteries. I also have room to include my hand-held transceiver, my hand-held GPS, Jepp books, some money, a roll of Velcro, extra keys to things, a small medical kit and about 20 of those little yellow AOPA rulers. I weighed this bag, wrote the weight on a card and tied it to a handle.

Then I made a rule: If you bring something into my airplane, take it with you when you leave. And there shall be no stuff in the seat-back pockets after the trip, and there shall be no stuff under the seats. I break this rule every time I go somewhere, and I have to clean it out every month.

To the glove box I return only current copies of the *Airport Facility Directory* and a pair of Ray Bans, and, until my insurance company gave me a neat chart holder, I put current copies of sectionals in the box. They fit perfectly; the box was designed for them. I put nothing heavier than my Ray Bans in the box because heavy things will knock the door open and come out during an energetic departure, upsetting the right-seater. In the side pockets I keep the control lock, a small flashlight and a round, four-inch E6B; there is room left over for whatever Jeanne decides to keep in the pocket while she's in the airplane. In a separate 8 1/2- by 11-inch portfolio, which slides into one of the

pockets, I made copies of the most recent weight and balance and gathered some blank weight and balance forms, an original copy of my airplane manual, a copy of all performance limitations, U.S. Customs paperwork, state registration, proof of insurance and names of people to call if I've died. My 30-day VOR check is in this portfolio, and during a ramp check I hand it to the FAA inspector so he or she doesn't have to get into the airplane.

The small, 7- by 9-inch notebook, or one-inch Jepp manual, is my flight book. I carry it like a missionary carries a Bible, and, like a missionary, I believe that everything in this book is true. If I need to find my best L/D or glide speed when 35Q weighs 2,100 pounds, the number is in there, and it works because I have tried it. There is nothing in my flight book that I haven't tried and proven to work. I have no factory performance charts, no factory checklists, no placards, no three-paragraph instructions on what to do when I smell smoke. My flight book belongs to my airplane and it is loose-leaf so that I can change the data as my airplane changes. All of the important checklists and procedures that I use to plan a flight and execute a flight are in my flight book.

Within the covers of my flight book I have the information that will start my preflight, my weather check, my flight planning, my personal checklist and my climb, en route, descent and terminal operations. I fly from page one to the back of the book. When I arrive in the destination terminal area, I am working from my data and flying a Jeppesen approach procedure to the runway. When I taxi to the ramp, the back page helps me shut down, cancel and secure the airplane.

It's a small book and it's loose-leaf, and when I get out of the airplane it goes with me to the FBO desk to check in and make a fuel request, and it goes with me to the weather room to plan and to the telephone to file for the next leg.

Like the missionary, when I contemplate a flight, this book

draws me away from the distractions of the earthly world and leads me into the orderly 'devotions' of preflight activity.

My flight book helps me to become a pilot, stay a pilot and comply and fly a trip. I will describe my book, and you can copy it or build something else that fits your needs.

## Chapter Eight

I have flown with more than my share of pilot stuff. I have had lapboards, lap desks, knee boards, briefcases, flight cases and cases of maps and pens. I have had E6Bs, nav logs, weather logs, big timers, small timers and pilot watches. I have used at least 30 feet of Velcro in my flying life, and I have carried more paper and tools and toys into the air for a 100-mile trip than most air crews have carried on round-the-world record flights.

The truth is, the gadgets often get in the way of real preparation. What we are trying to do is flight plan as accurately as possible, preflight the airplane without missing anything and get the Skylane started and run up without forgetting something. We want to depart, climb, cruise, descend, level off in a pattern and land. We can do all of this, and copy an approach clearance as well, with a pad of Post-it® Notes.

The problem we have is organizing the flight planning information and getting it to the cockpit in useable form. We either tend to bring too much stuff to be of any use, and as we bolt through the airspace at 150 mph, our data slides under the back seat, or we don't bring enough to figure out how to fly our departure clearance. We either end up with a lap full of charts and directories, in-flight calculators, navigation logs and laptop com-

puters, or we throw it all in the back and then find ourselves telling ATC to stand by while we dig out the numbers, one by one.

And we have flown with no preparation. It's easy VFR flying. We check the sky to see if it's blue, check the airplane for gas and oil, see if everything that ought to be attached is attached, start up, get ATIS, call ground, call tower, take off, sit back and enjoy the cruise. A few minutes from our destination we get ATIS again, call tower, land it, call ground, park it and go to lunch. Nothing wrong with that. When we finish lunch we go to the airplane. If the sky's still blue, we fly home. If the sky is gray, we get edgy. If the airplane's wet, we begin to feel an information deficit, and if we can't see the airplane, we start thinking about a quickie IFR. And there's a lot wrong with that.

Our flights are successful when we have done our preflight planning so thoroughly that we don't need the preparation. Just as we practice stalls over and over and over so that we come to recognize an imminent stall before we need to use our practiced recovery techniques, we make a plan to fly so we don't have to use its contingencies to survive. Dave Moran paraphrased the old flyer's adage when he said, "Superior pilots use their superior preparation so they don't have to use their superior skills."

The questions are: How much do we need to know, and how do we get the information into the airplane in a form that we can use?

A flight is more enjoyable, by far, when we have built a foundation to fly long before we ever open the hangar door. When we take the time to get the airplane, the environmental questions and ourselves organized, then we can go to the airplane and jump in and fly difficult conditions on unfamiliar routings, get there, land and go have dinner. That's the way the airlines fly, and the corporate jets, and the military. To the professional, flight preparation means having such thorough command of the airplane and

the environmental factors of the trip that the flying appears easy and relaxed and the flight is safe and efficient.

So how much do we need to know? The answer, according to Federal Aviation Regulation 91.103, is simple: All available information. "Each pilot-in-command shall, before beginning a flight, become familiar with *all* available information concerning that flight." It seems a bit overwhelming. But it gets easier when we think about it and realize that we are only responsible for 'that flight.' We only have to know *all available information* for one flight at a time. And what's a flight? Nine things. We take off, climb, cruise climb, cruise, descend, come into the terminal area, descend again and either land or go around.

We preflight by gathering information about these nine different segments of the flight environment. We need to know how the airplane will perform, what the atmosphere is like and how we plan to pilot the airplane in each segment.

The information we want will come from the Skylane flight manual, a weather briefing and a manual of procedures that we follow when we operate an airplane on an airport, on airways, in traffic patterns or on an instrument approach. The *Aeronautical Information Manual*, for example, tells us about these procedures.

And how do we get this information organized and reduced to some kind of manageable form so that we can use it in the cockpit?

Recently, Jeanne and I went to a concert. I protested, but we went to the concert anyway. As I watched the orchestra members file in and take their seats and watched the conductor get organized and lift his baton, I thought how much this moment was like the beginning of a flight. We practice, we get organized, we get settled down, and then, when the tower says cleared for take-off, the baton comes down and away we go. Like the orchestra, the flight is in motion, moving through time, while we are apply-

ing skills to get the nose at the right attitude, checking the altimeter, talking to the tower and Departure, managing the power, watching engine instruments and getting on course.

If the conductor hadn't done his preconcert planning and made the notations in all the right places, he'd be behind the orchestra, thinking about what the strings should be doing while they were doing it. Then he'd have to worry about the horns and the percussion and the strings again. He'd get tired very quickly, and shortly he would be very far behind the orchestra. But this guy had done his work, made the notations and rehearsed the variations, and that night, when the baton fell, he flew the orchestra. He climbed through the first movement, leveled and cruised, turning the pages of music as he thundered along.

"Turning the pages ... ," I thought. "Wouldn't it be nice if pilots could fly like that? Take off, turn a page, climb; cruise climb, page three. En route, page four. Descend? Turn the page; level off, page five. A flight book would become our 'score' for the trip. I leaned over and kissed Jeanne and smiled. "Thank you," I whispered.

We could build the flight book in such a way that all of the information we need for a trip could be scored in nine movements.

For me, at least, it would have to be a very simple book. I'd want the first section to tell me at a glance the current status of my Skylane. The second section would guide me through a preflight briefing; the third might display my customized preflight checklist. I'd want a page to get me off the ground and on course, a page to keep me on course, en route, and a page to get me organized to descend, level off and get into the pattern. If I were going to do this, that book would have to tell me everything I need to know.

We take off, climb, cruise climb, level off and cruise. Later, we descend into the terminal area or the traffic pattern, descend

for the approach, fly the approach and either land or miss the approach. We experience those nine movements whether we are joy riding VFR or are flying IFR on a 400-nm business trip. If we look carefully at the segments, we see that we can reduce the nine segments into three operations: departure, en route and arrival. If our book provided a checklist, operational data, weather, navigation and ATC information about each of these three phases, then we would have an excellent outline to guide us through flight planning and, like the conductor, we would have 'the music' in front of us to fly the departure, get established en route and arrive at a terminal. There would be nothing on our laps but the book, and when we had flown one movement and briefed ourselves on the next, we could close the book, put it on the floor and enjoy the flight. When ATC calls and says an amendment is coming our way, we put down our Coke, pick up the book, which has a 5- by 8-inch pad of paper and a pencil clipped to the cover, and say, "Ready to copy." If we happen to be en route, we open the book to the 'en route' tab, take the chart out, find the new routing, pencil a few notes on the pad, close the book, put it back on the floor, drink Coke and fly.

The preflight preparation for the three movements, departure, en route and arrival, forces us to become pilots before we ever get to the hangar, and the very act of building the entire flight gives us clues to problems that will be a lot easier to solve on the ground, before we go, than when we are in the air and in the clouds, when we have other things to do.

When we plan a long-distance flight, say a family vacation to a warm spot a thousand miles from home, we often end up with what I call 'the shrinking plan.' We start at home several days before the flight, collecting weather information, and we look over the route carefully, making notes. We gather charts and draw course lines; we build elaborate navigation logs that take us from the comfort of our home flight planning center to the deepest and

darkest corner of the country. We may even do a real weight and balance, running around the house asking everybody how much they weigh and how much stuff they are planning to bring on the trip. The day before we depart we grow hungry for winds aloft data so we can plan our flight altitude and fuel stops. When we launch, we are ready, eager to put our plan into effect. But as we fly along and deal with delays and turbulent weather and family members who are feeling a bit sick, we get behind our schedule and our plan no longer makes sense and ends up under the back seat. We have flown out of our tightly constructed plan and it has no value, so we've chucked it. But now we don't have a way to organize weather briefings and aircraft performance en route, so we end up flying without a plan at all, driving the airplane from one fuel stop to the next, worrying about the weather, misplacing charts and getting edgy. If we arrive at our destination, we are tired and disappointed and our family doesn't think flying's much fun either.

The flight book is organized to get us launched and take us to our first fuel stop. Once we have the book 'built,' every leg of the flight is a simple matter of adding current data. When we land for fuel, we walk into the flight planning room with our flight book and follow a checklist to get a weather update and NOTAMS. We follow a checklist to file another flight plan, and we insert the next leg of our flight into the book.

Before I built my flight book, I made notes about what we do when we fly.

We take off. This is a bad time to be looking anywhere but outside at the horizon. We don't need to look for the throttle or the prop control or the flap switch, we just need to keep our eyes outside unless we are IFR, and then we are looking at an artificial horizon, DG, airspeed and altimeter. VFR or IFR, no paper is needed here. Because we have studied the data before we

depart, the flight book is on the floor. We fly an initial climb as outlined in our book. This is hands-on pilot stuff. We have determined that the initial climb will be made at best rate, for example, and that's easy to do. We set the pitch, check to see that the airplane is getting the power it needs, cross-check an airspeed and spend our time looking for traffic. If we are IMC, we are scanning and trying to achieve a state of relaxed concentration. Most of us engage in some kind of cruise climb, assuming we aren't flying around at pattern altitude. A cruise climb is good for cooling and it makes the engine happy; it's good for visibility and we go further over the ground as we climb. There's no paperwork here, unless we are IFR, and then we are communicating, getting clearances or vectors. It's a no-brainer. With the book closed in our laps and a 5- by 8-inch pad of paper clipped to the cover, we can write down altitudes, frequencies, squawks, turns and even full-route changes if the airplane is under control. In VFR cruise or en route IFR, there are times when we have to look for things to do. The small pad of paper and a couple of en route charts or sectionals are more than enough 'tools' to get from Chicago to Denver. The planning is in the book, if we need to look.

Things get more interesting during the last six phases of flight. When we leave the en route altitudes and head for the ground, we've had time to review the 'numbers' under the 'terminal' tab in our book. Now stuff can happen fast. If we are IFR, we pull our chairs up, pump some adrenaline, open our flight book to the 'terminal' tab and dive into the muck, blazing away at ATC with our push-to-talks. We will fly headings and make descending turns to an approach course and land.

VFR to an uncontrolled airport isn't much different. We drone along at some altitude, enjoying this beautiful country from the air, until we get, say, 20 miles from the airport, and then we begin a gentle descent, comfortable to our passenger's ears and sensibilities. We look for traffic and fetch the flight book to confirm

frequencies, traffic pattern altitudes, runway alignment and length, all outlined on the 'terminal' pages of our book. We reviewed the data once when we created the pages; now all we do is set up the frequencies and put the book on the floor. We can get busy quickly, especially at an unfamiliar, uncontrolled field.

We make a radio call 10 miles out, and again at five miles and three miles. Our calls have awakened a couple of airplanes in the pattern. We reduce the power, fly at 100 mph and trim, look for traffic, find the runway, look for traffic again, slow down to 80 mph, trim, make a radio call, get into the pattern, check the winds, look for traffic, call downwind, carb heat, mixture rich, prop forward, cowl flaps closed, turn on base, call base, airspeed 75 mph, 20° flaps, pitch forward, check traffic, report final, check the fuel, 40° flaps, pitch forward, trim full aft, hand on the throttle — if we have to go around we'll apply full throttle and peg the airspeed at 70 mph until we are clear, then ease the flaps up and get back into the pattern. Spot the runway, hold it off, flare and roll out. If we did it all smoothly and didn't frighten the passengers or drop it in, we feel pretty good. But it would have been a lousy time to be looking for information.

One cold, rainy weekend I organized my flight book. The first page of my book is a sheet of paper upon which I have written eight things:

1. Date.
2. 35Q's tachometer reading.
3. Useable fuel in gallons.
4. Weight of semipermanent baggage. (Remember that we weighed all this stuff before we put it back in the airplane?)
5. Weight of fuel on board.
6. Current weight (empty weight + semipermanent baggage + fuel on board).
7. Available payload.

## 8. Maintenance required.

My first page was created at the end of my last flight when I taxied to the hangar from the fuel pumps and shut down. Line service filled my tanks, and I climbed up on the ladder to check it. My tanks hold 65 gallons of fuel, 390 pounds of gas. This is weight and balance information, so I express it in pounds. Sixty gallons are useable, or available for flight planning, so I express that number in gallons. I've installed a Shadin Fuel Flow Meter in my Skylane and I have confidence in the instrument, but I compare the 'fuel remaining' indication to the calibrations on a small stick that I carry and use to measure the tanks. Sticking the tanks has become a part of my postflight operation.

There was a time when I didn't know what to do when I was finished flying for the day. I pushed the airplane into the hangar and walked around wiping a spot of oil here, removing a bug or two there. Sometimes I just sat in a lawn chair and wound down, looking at my Skylane in utter amazement that such a beautiful machine could exist.

A few years ago I decided that I could spend the time doing something a bit more useful, so I started doing a postflight inspection, which I found uncovered problems that I didn't have to deal with before my next flight. So I do a postflight inspection, stick the fuel tanks and check that the fuel flow meter and the stick agree. Then I fill out the first page of my flight book and it looks like this:

Date: 5/23/96

Tachometer: 4391.6

Useable fuel: 60 gallons

Semipermanent baggage: 42 pounds

Fuel on board: 390 pounds

Current weight: 2,170.1 (empty weight, 1,738.1 + baggage, 42 + fuel on board, 390 = 2,170.1)

Available payload: 629.9 (gross weight, 2,800 pounds - current weight, 2,170.1 = 629.9)

Maintenance: Nosewheel needs air.

If I had any difficulties during the flight, or strange and unexplained happenings on the panel, in the engine or on the airframe, I write them down on the bottom of the first page. If I cannot explain the problems, I stop at the shop and ask them to look into the strange ones. Then I put the airplane away, clean out my Coke cans and anything that is not a part of my semipermanent baggage and go home — with my flight book.

An airplane's status, when it's sitting on the ground, only amounts to three things. It has a certain readiness for the next flight, it has a certain weight and it has a certain amount of useable fuel on board. When we remove ourselves from the airplane for a couple of days and go back into the chaotic world, we forget about its status. We can deal with this problem two ways: We keep track of its status ourselves or hire an FBO to do it. If we hire an FBO to keep it gassed up and full of oil and in good maintenance, we still have the 'ultimate responsibility' for a thorough preflight, and even if we live in the fast lane and have the luxury to call the shop in the morning and tell them to get it out by 10 a.m. for a trip, we are still responsible to check it out ourselves and determine its readiness before a hop.

I am reminded of a guy — not a Skylane pilot — who used his airplane frequently and had quite a lot of time in the type. The man was a doctor who said he didn't have the time to manage the maintenance of his airplane. Typically, he called the FBO, ordered fuel, drove to the airport, kicked the tires and took off. One day he took off and the engine seized when he was a few feet off the ground. In the confusion, he plopped back down on the runway and went zooming off the end into the tulips. The engine, as it turned out, didn't have much oil in it. Someone had started

an oil change, gotten busy and put a note on the prop saying, "Don't fly." The note departed the prop and, when the good doctor called, line service pulled the airplane out. Since the doctor 'assumed' the shop was 'taking care' of his airplane, he didn't preflight, burned the engine up, wrecked the airplane and sued the FBO. He damn near won the lawsuit. Fortunately, the whole expensive incident caused the doctor to quit flying, and the shop created some new rules.

We are blessed in this country to have the best FBOs in the world. To encourage customers to use general aviation, many shops offer maintenance and line service programs to ease the time-consuming and often dirty work of preparing an airplane for flight. The FBO stores the airplane, tows it to the ramp, washes the windshield, fills the tanks, checks the oil and drains the sumps to the customer's specifications. The pilot arrives with his passengers, hurries through the lounge and loads the airplane.

For a moment the pilot is alone with his airplane and we see him walking around the Skylane, his tie blowing in the wind. He shakes the elevator and pokes at a static port. He's about to open the oil access cover when a line service technician drives by on a tug. The pilot asks, "You guys put oil in this morning?" The tech says, "Yes, sir!" The pilot pats the oil access door and climbs into the airplane.

The questions you and I have to ask are: When do we start taking responsibility for the flight? When do we become pilots? Are we not pilots until the engine is running? Or is it when we've got our scarf tied and our goggles firmly in place? The FAA says we are in charge, we have the 'ultimate responsibility' from the time we preflight until the time we are back on the ground, shut down and secured. The proficient pilot who arrives at the airport in a business suit sends her passengers to the lounge, slips on an over-size flight suit and gets down on her hands and knees and grubs in the oily goo and sumps the tanks.

The preflight inspection gets us into the flight, it helps us to understand the airplane, and it makes us pilots. There's no way around this one. The airplane is our responsibility. We are either pilots on this trip or, if we haven't got the time to take responsibility for our flight, we'll need to buy an airline ticket.

I'd been out of the pilot loop for a few days, trying to earn a living, when I got a phone call from a customer who wanted me to come to a meeting in Sioux Falls, South Dakota, 223 nm southwest. She said the meeting would begin at 1 p.m. Someone would pick me up at the airport at 12:30. I looked at my watch. It was 9 a.m.

"Can we expect to see you?" she asks.

When we buy our Skylanes we envision trading our hard-earned money for a certain amount of utility. Even if our primary motive is to fly on weekends and take the family skiing once a year, we imagine ourselves using the airplane, from time to time, as efficient business transportation. We recognize that there is a difference between flying 800 miles to Colorado on a family vacation and flying 200 miles to a customer with a meeting time set in concrete. On vacation we can afford to lay over if the atmosphere doesn't cooperate. Jeanne and I have spent some money with Super 8 because the afternoon turbulence finally wore us down or because our destination was forecasted to be marginal about the same time of the day that we felt marginal. It's a vacation, time is on our side, and we've seen some pretty wonderful bits of Americana off the freeways, laying over in airport towns.

But what do we think when the customer asks, "Can we expect to see you?" We say, "Well, let me check the weather and I'll get back to you." Inevitably, the voice on the other end of the line will say, "Ahh, it looks good here."

The challenge. The glove has been dropped at your feet. And

you can't win this one. If you try to explain that the weather is complex and there are factors besides a little local sunshine that will influence your decision, it will have the same effect on a listener that a fisherman has when he shows off his new fish finder and an empty stringer. "Well, see, the lake is very big and there are only a certain number of fish ... ."

No. We have leaked it that we fly airplanes. We have already told the stories of flying 200-nm trips in an hour, passing cars and beating the airlines. There is no backing out. If we fail a trip because of a forecast for thunder or ice or turbulence, we think we lose credibility.

Last summer a friend called me to see if I might fly him to Iowa. "Sure," I said.

A few days later he called to remind me that we were going to Iowa the next day. I'd forgotten. I checked the weather and saw that there would be a very strong and deep line of thunderstorms moving across our path on the way down. I told him we'd either have to leave very early or much later than he had planned.

"I'll drive," he said, a bit miffed.

A few days later he called to tell me that he drove through the worst rain he'd ever seen. "They had hail and tornadoes just west of me. I mean, I'm listening to this on the radio, Dick, and I'm driving faster and faster to beat it. Jeez, I wish you had flown me. The clouds were really low; we could have flown over it."

So you can depend on not winning. Even if you are right, you lose. If there's any consolation, it comes to us late at night when we know that the trip would have made someone sick, frightened or dead.

I gave up being a macho pilot. I also gave up bragging about the efficiency of airplanes in mixed company. Most of the time we can fly. Some of the time it can be dangerous to fly, and the rest of the time our decision to go has to do with our level of comfort with the conditions. When we've been challenged to make a

flight, our passengers will be more forgiving of a cancellation than they would of three hours in hell — which is what it is when you are stuffed into the back seat of a hot, noisy aluminum can, sloshing around in the midday thermals and watching the pilot fight to keep the wings level while you sweat, your ears plug shut and your stomach sours and rises into your chest.

“Can we expect to see you?” my customer asks again.

“Sure, see you about twelve-thirty. I’ll just check the weather and get back to you if there’s a problem.”

And then she says, “Ahh, it looks good here.”

And we say, “Good, I’m looking forward to some nice weather for a change. I’ll give you a call in a few minutes if there is a problem.”

Then we go to the computer and punch up the trip, checking the NOTAMS too, because we know how embarrassing it is to arrive over our destination on time only to find out that the airport’s been closed for three weeks for construction.

Even though I haven’t piloted anything faster than a desk for a few days, I’ve come back into the loop by logging on to a weather service. I prefer to get the ‘big picture’ or the synoptic view myself, using DUAT or another computer service, just because it makes me think. Logging on requires that I think about routing and altitude and wind, and by thinking about the atmosphere, I have to begin to organize myself to fly. And that’s when I reach up to the shelf over my desk and retrieve my flight book.

## Chapter Nine

Our flight book will get us started by organizing our thinking. The flight book will take us from where we are, say at our desk in a busy office, to a serene level where we can effectively flight plan. If we are interrupted, the book takes us back to the flight.

I have organized my flight book like this: At the front of the book I have a page that describes the airplane status. This is where I keep the pages that I filled out at the conclusion of my last flight. When I have been away from the airplane for a few days, these pages will tell me how much gas is available, how much semipermanent baggage is on board and what remains of my useful load. Beyond the status page, I have a divider that I call 'flight planning.' Here I have a small map of the United States with many airport and nav aid facility codes. I can easily find Sioux Falls, South Dakota, for example, by looking for the identifier, FSD. When I turn this page, I find on the left the standard questions to ask for a preflight weather briefing and on the right some blank Jeppesen nav logs. Jeppesen has organized the log on a small page in such a way that I can easily write down en route checkpoints, altitude, course, fuel burn, distance and ground-speed. I use the log as a checklist when I am in a distracting environment, trying to get a flight organized.

On the back page of the Jeppesen nav log, there is a good format to gather weather information. When we start flight planning, formats such as these are useful to get us moving along, gathering helpful information and not just wandering in a sea of data, becoming confused and sidetracked and spending a lot of time gathering stuff that we'll never use.

The next divider is called 'departure.' Here I have a preflight checklist, my start-up check and a guide to help me set up my radios on useful frequencies. My pre-takeoff checklist is here, as is a small box that tells me what airspeed to use for a given weight. If I am departing IFR, I keep my departure airport approach plate here, and a Standard Instrument Departure chart if one is available. If I am departing from a large, unfamiliar airport with confusing taxiways, I have inserted an airport diagram here.

The 'en route' divider is next, and there I keep small lists of things that I may need en route: a checklist to give useful PIREPs, a checklist for lost communications, position reports and criteria to perform a VOR check. On the reverse side of this page I have a cruise checklist to help me organize power settings and help me set up my radios and navigation in a useful way. Here I have my maneuvering speeds for weights at 100-pound intervals, and I have a list of best L/D speeds (best glide) for a variety of weights from full gross to several hundred pounds above empty weight. I keep an en route chart in a pocket here, and a few approach plates for my alternate.

Under the 'terminal' tab I have a descent and prelanding checklist with airspeeds tied to a variety of airplane weights. There are Standard Terminal Arrival Route pages and a pocket for an area chart here, and if I'm VFR I'll include a page that tells me what frequencies to expect along with an airport diagram. I keep my arrival approach plates here for IFR, and I put a few alternate approaches in the back of the book in case I need them.

And that's it. There's enough data here to get me off the ground, in the air for three hours and back down. I have never had to dig for a chart or an approach plate in the back of the airplane, where I keep my full Jeppesen service.

Beyond the 'terminal' or 'arrival' divider I have these sections: 'radio aids,' which is a page of VOR/NDB frequencies that I use routinely — but forget routinely as well. I have a divider called 'emergency.' Here I store a checklist that I have made to get the airplane flying while I sort out what's wrong. I have a 'table and codes' page that has a few formulas on it and a 'gradient-to-rate' page that I use during an IFR takeoff. I have a 'meteorology' tab that translates METAR and TAF code and a map of weather advisory reference locations, which is handy when you are away from home trying to figure out where a Convective Sigmet or Airmet is in effect.

I have a tab called 'entry requirements,' which helps me get organized to get through customs, and I have a pocket here to hold all the forms that are produced when we cross a border.

And finally, I have a tab called 'airports.' Here I store approach plates I may need on a trip, IFR or VFR; they give me current airport data, frequencies and a diagram of the field.

All of this fits in a one-inch binder with plenty of room left over to add odds and ends, but my goal has been to keep the book simple. I do thorough planning, reduce everything learned to a few pages and then fly with the book on the floor.

Before we begin planning a trip we want to know three things: the Skylane's condition, the condition of the environment and if we are in condition to fly the airplane. As we 'brief' on these three topics, we begin to see the flight in a routine way; the more thoroughly we prepare, the easier it is for us to understand the information and sort through it for the important stuff that will go with us into the cockpit.

We have taken care of many Skylane questions by filling out our postflight data sheet. We can see at a glance whether the airplane will need fuel or maintenance. We can see at a glance our available payload, and that will help us decide how much fuel we will order. If we have made a note to check the air in the nose-wheel, this is when we call the FBO and see if that work has been done.

We think of the flying environment as the space for a certain distance beyond the cockpit.

It includes the space above us and below us and on all sides of us in the air and on the ground. The size of the space changes. When we are on the ground, taxiing our 36-foot wings between hangar buildings, we may feel comfortable with an 'environmental box' that is 50 feet long and 75 feet wide. If the taxiway is slippery and we would like to have more 'protective space,' we may decide that our box is 200 feet long and 100 feet wide.

When we are climbing our Skylane away from the airport through a busy terminal area, we feel comfortable about a box that is three miles square and 2,000 feet deep. We get edgy when ATC tells us that traffic is crossing inside our environment.

When we pull our Skylane out of the hangar, the building itself is a part of the airplane's environment. The Bonanza that is taxiing in our direction is entering our protective space, and we keep an eye on it. If we start our engine on loose dirt or gravel, the duststorm we create with our propeller blast leaves our environment and makes another environment dangerous. As pilots, we are concerned to protect our airplane's environment, to guard it against things that will make our flight difficult, and we are concerned that we don't produce problems for someone else. When we begin to think of 'our space' in this way, we begin to appreciate clearing the area around the prop before we start our engine, and we begin to understand the noise 'footprint' that we leave on airport neighbors when we depart.

When we flight plan, we are imagining a box that begins at the end of the runway, ascends to a certain altitude and then goes somewhere and descends to another runway. We envision the sides of the box starting at, say, 75 feet when we are on the surface and then becoming wider as we climb. The faster we go, the wider the box becomes until, at cruise, we fly down the middle of a five-mile box.

The length of the box is controlled by time. We want to 'own' the space ahead of us for at least five miles, and to do that we need to know how fast we are going. If we are flying at a ground-speed of 150 mph, we will be using space at the rate of 2.5 miles a minute. In two minutes we will have flown out of the end of our five-mile box. So we add another five miles, making a total of 10 miles, which gives us four minutes to think. At my age, I need to think ahead at least 15 minutes, so when my Skylane is cruising at 150 mph, I imagine that my protective box extends ahead of me about 35 miles. I am vigilant about that space. When I did my flight planning I looked for problems along the route and made notes in my flight book that I will use in the airplane as reminders that I may be sharing airspace with a problem in that 35-mile segment. What kind of a problem? If we are flying low and easy, tall towers, residential development or recreational areas could be a problem. We may be routed close to a busy uncontrolled field where the arrivals and departures will cross 'our' airspace, or we may fly near an MOA or a restricted area. On a four-hour cross-county leg at 8,000 feet, away from surface activity, I might think in 40-minute blocks, which gives me 100 miles of airspace to think about. This is useful to me when I consider the weather.

We don't like meteorology much because it is so damn hard to understand, and we've been surprised enough to know that forecasts are dependent upon combinations of factors that can befuddle the best meteorologists. Knowing this, we are tempted

to look at current weather and go when it's sunny outside and hedge and become edgy when it's cloudy. We are pilots, and we like results that are dependable. When we push this thing, we expect that to happen. The weather works that way too, but many combinations of warm air and moist air and wind have to get moved and stabilized for something predictable to happen.

Like the FARs, the weather seems a bit overwhelming until we realize that we need a very small window of flyable weather to complete our trip. If we are planning to fly to Sioux Falls from northern Minnesota and it looks like a two-hour flight, we don't need much information to accurately predict what will happen during our flight in the box.

All we *want* to know in order to fly to Sioux Falls from Minnesota is this: Will we be flying in cloud? Are there bumps in the clouds or will it be smooth? Will there be ice? Will there be thunderstorms? Will we have to fly an approach when we get to FSD? Has anybody flown the approach today? Are they alive? Where are we going to go if there's trouble? Are we going to be able to fly home tonight or will we have to stay at the Super 8?

What we *need* to know is this: Is there much moisture in the air between northern Minnesota and Sioux Falls? Is there a lot of moisture? What is the temperature at departure, en route and at our destination? Is there any wind on the surface? From which direction? What are the forecasted winds aloft? From which direction? Are the winds aloft bringing air to our route from the south or the north? Does the terrain beneath us rise en route or fall or what?

The information that we need in order to get a useful picture of the current and forecasted weather is available by phone, by fax, by home computer, by a personal visit to an AFSS, by chatting with a NWS office, by looking at the weather page of USA Today or by listening to the Weather Channel. The answers to our questions are available, but how we collect weather information

determines, I think, how useful the information will be and how well we construct a weather picture.

We fly our Skylanes in a tiny stream of air within a larger river of weather. Our flights are sensitive to the effects of weather for a known amount of time. When we envision a direct flight of 274.8 nm, we know that we will be exposed to the atmosphere for two hours. We have created a box through which we can fly with an accurate picture based on current weather. If there are reports of challenging phenomena (ice, fog, thunderstorms, turbulence) within or bordering the box, we have the problem to decide whether our experience and our airplane and our passengers are up to the task. If the current weather is flyable, we have then to decide what will happen within our two-hour passage. To make this decision we need to look at what's happening 60 miles on either side of our box. (Bad weather moves fast, beats us up and goes away; really bad weather moves slowly and makes for large bills at the Super 8.) Since I plan to sit on the ground at my destination for a couple of hours, attend a meeting and then make a return flight, I need to look at yet a bigger picture, say 200 nm on either side of my box.

I'll need observations that tell me three things: how much moisture is available, what the temperature is and what's happening in the wind fields aloft. And for my southwest routing from northern Minnesota to South Dakota, I'll need these observations from a bunch of points west of my route, unless there's a low pressure to my southeast — then I'd better look at observations in Wisconsin and Iowa as well.

If there is no moisture, there is no IFR weather. If there are no active wind fields (on the surface or aloft), my chances of running into really convective weather are minimal. If the temperature is very high and the moisture is low, it's VFR. If the temper-

ature is high, there is a lot of moisture and there are strong surface winds and strong winds aloft, I'm going to cancel the trip.

In order to create a clean mental picture of the weather, I will use a small U.S. map in the front of my flight book to pick out identifiers for weather reporting sites. Most of these are automated sites these days, but they have the observations I want.

I write down the temperature at my departure, at several points en route and at my destination. I look at these temperatures. If they seem consistent or gradually warming or cooling, fine. If the temperatures are in the 50s at my departure and then suddenly rise, en route, to say the 70s or 80s, I can be sure that I'm going to have an interesting ride.

Then I look at the dew points, and I write them down from departure to destination. The dew points are warning flags when they are high because they are a measure of the moisture available in the lower atmosphere. Remember that the recipe for bad weather is heat, moisture and something to lift the moisture (wind, a mountain, a front or rising terrain).

Next, I look at the surface winds. If the reporting points show a consistent flow inside my 200-mile box, flying for the next four to eight hours will be tolerable. If the winds at my departure are weak and they grow stronger as I fly en route, I am heading toward a weather system that may produce bad conditions.

The winds aloft forecast will tell us about moisture, temperature and wind in the upper air, the air in the larger river that also affects our flight. If the winds are great (25-40 kts at 3,000, 6,000 and 9,000 feet), there is an active wind field aloft, meaning only that if there is some moisture to advect from a wet place, these strong winds will advect it fast and the weather will change. If the winds aloft play from the south at 3,000 feet and seem to be veering with height (moving clockwise, from say 180° at 3,000 to say 280° at 9,000 and 300° at 12,000), the upper air may be drawing moisture into the wind field. And finally, the winds aloft

forecast temperature in the upper air. If the air above us is very much colder than the air at the surface (colder than the normal lapse rate of 2°C per 1,000 feet), we can expect the surface air to rise quickly (thermal) and produce thermal convection, turbulence and even thunderstorms if there is enough moisture (as noted by looking at dew points along and on either side of our route).

So we are scanning weather reports and the METARS (Aviation Routine Weather Reports), and we are scanning winds aloft forecasts to determine temperatures and moisture and wind in the upper air. We do the same kind of scanning when we look at the Aerodrome Forecasts (TAF), PIREPs and all of the convective reports and outlooks. We are detectives looking for evidence of temperature variation, moisture availability and wind fields that will precipitate the movement of hot, moist air.

If we were to zoom back, way back, so that all we see of the Skylane in flight is a small dot, then all of the space around the dot would be weather. If the air in that space is warmer than the air above it, it's rising and our Skylane is trying to rise with it. If the air is cooler than the surrounding air, then our Skylane seems sluggish as we increase the pitch attitude to keep from sinking.

If the air that surrounds our small dot of a Cessna is moist, having come to us, say, on a wind that transported moisture from an ocean, the air in our box becomes hazy as light is refracted and diffused by the very small water droplets. If the air should cool on the ground, like it does at night, and the winds become light, the moisture may condense and become fog.

When we are on the ground looking at weather reports and forecasts, we are trying to imagine the three dimensions of the space in which we plan to fly. If it is a sunny summer's day, then we can imagine how the sunlight is absorbed by the ground. As the ground heats up, bubbles of warm air rise up toward our flight

path. In the airplane we feel these bubbles as bumps at first, and then, if we were to stay around and watch, the bubbles would rise further into cooler air and condense and become small, fluffy cumulus clouds. If we were to hang around a while longer, we might see that these small clouds are joined by others and may form a deck of cloud or a ceiling. If there is a lot of moisture in the air and strong thermals, it's probable that the small cumulus will develop into larger heaps of cumulus, which become turbulent as moist air rises and cools and then condenses inside the cloud, creating more heat caused by the condensation. The heaping cumulus or congestus, as it's called, may produce more vertical clouds, which grow taller and taller in our atmospheric river, called the troposphere. Our troposphere is characterized by the decline of temperatures with altitude. The temperatures on the surface of the earth decline at the rate of  $2^{\circ}\text{C}$  per 1,000 feet until they reach the top, or the tropopause, where they stabilize or even warm slightly, causing an inversion. Clouds that build into large thunderheads often appear flat on the top where they meet the more stable or inverted air of the tropopause. The tropopause is quite high above the earth and it varies in height from about 25,000 feet over the poles to 60,000 feet at the equator. Over the United States, between  $30^{\circ}$  north latitude and  $60^{\circ}$  north latitude, the trop, as meteorologists call it, averages about 45,000 feet in the summer months and 35,000 during the winter when the air is cooler and dense.

An unstable cloud that produces rain is called cumulonimbus. The cumulonimbus cloud makes rain when the droplets of circulating moisture become large and too heavy to rise so they fall to the earth. The cold downdraft produced by falling rain may push more warm air up, and the cloud may continue to grow until it has become a micro weather system of its own, a thunderstorm producing lightening and very strong, cold downdrafts that force more warm air up. This circulation is a weather factory that uses

heat and moisture to produce vertical winds, updrafts and downdrafts, which will make it difficult to control an airplane. Our Skylanes may be strong, but because the airplane is for some minutes actually stalled in a strong updraft and then abruptly forced to exceed its structural speed a few seconds later, control is difficult and may be impossible.

Fortunately, we have the chance to navigate away from isolated air mass thunderstorms. But when thunderstorms form in rising air pushed up ahead of an approaching cold front, they form in a line that may be 20 or 30 miles in length. We cannot fly through the line and we cannot climb over, so we land at an airport and wait for the line to pass.

When we have a thunderstorm in our box with us, it's a bad time to research its heritage. We leave the box and go to an airport where we can stay dry while we try to figure out what happened to our forecast.

We won't have to change our plans very often if we have looked very closely at the current weather and the forecasts along our route. If there are high dew points along our route and high temperatures and strong winds within 100 miles of our box, the forecasts will probably call for a chance of thunder, and that means that the conditions (heat and moisture and wind) are expected to be right for thunderstorm development.

I open my flight book and turn to page one. I see from my notes after the last flight that the airplane is gassed, there's enough available payload for me and a couple of passengers and I need some air in the nosewheel. I call the shop and ask if the work was done. Then I dial DUAT on my office computer and order these products: FA CHI (Area Forecast, Chicago region), TAFs (terminal forecasts, local, en route and destination), FD (winds aloft, local, en route and destination), METARs (hourly observations at as many points between my departure and desti-

nation as the AWOS or ASOS system supports), PIREPs, convective outlook and NOTAMS. If there is anything interesting about the current weather or the weather that is forecast between the time I leave homebase and the estimated time of my return, I'll call JeppFax and get a surface analysis and radar chart headed my way.

I turn to the first section of my flight book, which I call 'flight planning.' Page one is a map of airport identifiers in the United States. I turn the page and open the book. On the left side is a page outlining the standard items I'll need to get a preflight briefing.

On the right side is a Jeppesen navigation log. I fill in the information that I know:

Departing, 57Y direct FSD (Sioux Falls). I lean over to a map on my wall and measure the distance — 221 nm. I see that I'll be flying north of the Minneapolis Class B airspace. I write down the nav aids between me and FSD. I write down the frequencies of these nav aids. I keep current airport/facility directories in the glove box of my Skylane. At the office I get the information from a loose-leaf manual that houses a Jeppesen product called J-Aid. It's an airport/facility directory and Federal Aviation Regulations updated by subscription. I justify the expense because the book is well-organized, very accurate and always current.

I pick an altitude at which to fly by first looking at the weather. Today I see that we have a low to the west and approaching warm front conditions. The front itself is in South Dakota, but we've already got the overcast of moist air, and it's a pretty uniform system of stratus with bases at 1,500 and tops at 5,000 over the north and rising to 8,000 as I approach FSD. The temperatures are far above icing consideration and there is no convection reported, although the FAs include a chance for thunder by late evening when the cold front and the warm front will occlude close to the low. The TAFs confirm this. I will be back and 35Q

will be in the hangar by then. I'm still in the game. The FDs show a southeasterly flow north of the front and that the winds turn southerly on the southwest side of the front. The winds veer with height (run from a southerly direction to a westerly direction) so I'll have headwinds down low and a small tailwind component up high. I pick 10,000 feet. I take out an E6B and do a quick check on groundspeed —140 kts.

I enter the winds aloft in the Jepp log for my departure, en route and destination. I'll go slower as I descend from 10,000 into southerly winds close to the surface. My flight will take one hour and 40 minutes. If I get off the ground at 10:15 a.m., I'll make it for lunch with a half hour to spare, but making it in time for lunch is an observation, not a plan. I check my fuel burn and see that I'll use 22.5 gallons.

I call Flight Service and ask for a 'standard briefing' for an IFR flight for N3135Q, Cessna 182/U, departing 57Y, direct, FSD at one-zero thousand, ten thousand, departing at 1515Z, one and forty minutes en route arriving at 1655Z. The Flight Service briefer paints a picture that confirms what I learned on DUAT, plus I'll be given some current PIREPs and local NOTAMS. I file an IFR flight plan. The atmosphere is peaceful; the flight is on — so far.

I fill out the rest of my nav log; it takes but two minutes to get the 'numbers' written down. I turn to the second movement of my book: 'departure.' I pull a Jepp plate from another book for my departure airport, a plate for Minneapolis, in case I need to get on the ground 40 minutes into my flight, and I pull the area chart out for the MSP Class B airspace.

Then I turn to the 'terminal' section and insert the FSD approach plates and add another en route chart to the book. I check the rest of the tabs to see that they have current data. I take my flight book and the North Central Jepp binder to my car and drive to the airport, which is two miles from my office.

I open the hangar, put my Jepp binder into the front seat of the airplane, my coat in the back, and roll up my shirt sleeves. I pre-flight using my homemade checklist in my flight book. I see that air has been added to my nosewheel.

The engine starts nicely. I let the engine warm up for three minutes at 1000 rpm, and then I lean the mixture until I get a rise of 100 rpm. I throttle back to 1000 rpm and taxi to the run-up pad. My flight book is open on my lap, but I'm looking outside as I taxi, only glancing at engine instruments. During the run-up, I first see that everything works the way it should; I scan the panel for 'normal' engine temperature, vacuum pressure and ammeter indications. Then I go to my checklist to 'check' that I have covered everything. I take my sweet time doing this. I am not only checking to see that the airplane is ready to fly, but listening to my own responses to the checklist. If I'm forgetting things, I stop. I'm not a pilot yet. I wait, focus and start again.

When I'm ready to go, and when I seem to be operating like an airplane pilot, I look at my plan for the takeoff, which is printed under my checklist in the 'departure' section. At 2,340 pounds (current weight, 2170.1 + me, 175 pounds = 2,340.1) I will raise the nose of the airplane at 55 mph, climb at 88 mph and, before I enter the clouds, pitch down to 110 mph, get my clearance and cruise climb to 10,000. If something isn't working and I have runway ahead, I'll chop the power, deploy full flaps, pitch to 63 mph and land. If something goes wrong between the surface and 500 feet, I'll deploy the flaps to 40°, pitch to 63 mph and land straight ahead. Above 500 feet AGL, I will deploy 20° flaps, pitch down to 70 mph, turn with a bank angle of 30° and land on the departure runway. I know these numbers work because I checked each one on a cold day and a hot day at three different weights.

I write down the time of departure, close the book and put it

on the floor. All of the preflight planning that I have done is in my book. All the emergency procedures, performance figures and en route data is in the book, easily accessible when I need to look something up. I will not look at the book again until I am established in the climb and the airplane is flying nicely. Then I pick my flight book up off the floor and write down my IFR clearance and, perhaps, check out the routing of an amended clearance.

IFR or VFR, I don't want any paperwork in my lap until I've gotten the airplane off the ground and stabilized in the climb.

I take the runway and roll in four full turns of forward trim, which is the setting I use to get off the runway and stabilized for my initial climb.

## Chapter Ten

When we apply takeoff power, we would like to have a trim setting that helps us set up a climbing attitude, and to do this we learned to turn the trim wheel until the small wire indicator lined up with the 'takeoff' index marked on the center pedestal. The wire indicator is usually reliable, but over time it can become bent or it can stick and not point with precision. The number of times the trim wheel turns, from full nose up to full nose down, is precise, so we can learn to count full turns of the wheel and apply these numbers to an optimum trim tab setting — that is, a setting that will lead to the correct airspeed or attitude shortly after we are airborne.

On departure we can be very busy looking for traffic, talking to the tower or Departure and checking on airplane or passenger troubles. If the Skylane is climbing nicely without us having to exert pressure on the control wheel, we'll have time to look into other matters while the airplane puts distance between us and the earth at the correct airspeed, which is what we want.

When we sit in our Skylanes and roll the trim wheel all the way from full nose down to full nose up, we will discover that the wheel turns 14 times. I have found that if I pinch the wheel at the top or bottom and roll it smoothly and slowly from one end

to the other, counting the turns, I get predictable results every time. Because I count the turns, I never need to look down at the pedestal to see where the indicator is pointing. We don't care where the indicator is pointing; we care only for the results that the trim setting will produce.

Try this: Roll the trim tab wheel to full nose up. Then roll it forward (nose down) four complete turns. If you'd like, check the indicator and see if it isn't close to the takeoff setting. Then apply power and roll. As the airplane accelerates, lift the nosewheel off the ground — just off the ground — and hold it there. Hold that attitude. The Skylane will climb above the ground effect. Then relax the back pressure on the control wheel and the airspeed will settle down to a good cruise climb speed of 110 mph.

This trim setting works every time because the takeoff attitude of the airplane will be the same whether your airplane weighs 2,000 pounds or 3,150. At 3,150 pounds the ground roll will be longer, but the attitude of the Skylane (about  $10^\circ$ ) will be just right to break free of the ground. When we take off, we are pitching to a climb attitude and waiting for the wings to develop lift equal to the weight of the airplane. At full gross weight in my 1967 Skylane (2,800 pounds), I establish a pitch attitude that will allow the airplane to accelerate so that the wings will produce 2,800 pounds of lift. When the Skylane is moving down the runway about 60 mph, sufficient lift has been created by the wings and the airplane leaves the ground. I relax the back pressure very smoothly, and the nose comes down a few degrees. Now, because I have excess thrust, the airplane climbs in the ground effect and the airspeed increases, generating more lift. We simply hold forward pressure until we have reached 88 mph, then relax the control wheel completely, and the tab 'trims' the elevator for whatever speed I rolled in before I took off.

So we begin to think of the trim tab setting as speed selector. Starting from full nose up, four turns forward will set us up for

cruise climb (110 mph). If you would like to climb more steeply, say best angle of climb, simply rotate the wheel two turns nose up after you leave the ground effect. It's a poor idea to trim the airplane on the ground for a very slow climb speed, like  $V_x$  (61 mph). It's too much work to hold the nose down if we need a higher airspeed.

As the airplane begins its initial climb, we want to leave the throttle and the propeller control full forward until we are at least 500 feet above the ground, and then, using the propeller control, we will bring the rpm back to 2500.

Leave the throttle full forward. This bit of advice is heresy to many Skylane pilots, but it is gaining credibility with people who are tired of paying for thermal-shocked engines. We leave the throttle full forward for a couple of reasons. If something in the engine is going to break, it will probably let loose when the temperatures change quickly. When we applied full power to the O-470, we created heat — a lot of heat. We may have a temperature of 300°-400°F at the cylinder heads and 1700°-1800°F in the flamed mixture just above the pistons. The temperatures in the exhaust manifold will quickly rise from about 1200°F to 1400°F, while our oil stays 'cool' at 150°F. This variety in temperature is cooking and cooling many dissimilar metals. We are quickly heating aluminum and iron and steel and copper and we are creating stress on the metal parts when the temperatures change quickly.

When we started our engine, we first tried to get all of the dissimilar metals in the engine warm. Then, when we performed our run-up, we pointed the airplane into the wind to get air moving through the baffling to keep our engine from getting too warm. When we take off, the engine temperatures come up quickly, so we push the nose over in a cruise climb to get better cooling. If we reduce the power shortly after takeoff, we cool the engine

rapidly and we lose climb capability. It is easier on the engine to maintain full power, reduce the rpm and pitch over to a cruise climb speed to cool the engine gently. By using full power we gain altitude at a rate of 700-1,200 fpm, which gives us more options should the engine give us a problem. At full throttle we also take advantage of an auto-enrichening device that helps to cool the engine. Skylanes fly with a Mavel-Schebel carburetor, and the airplanes produced from 1973 on have a valve in the carburetor that allows differential pressure to pull fuel from the bowl and allows this cooling gas to flow into the venturi. If you have an earlier Skylane, you should check to see if the enrichment valve kit has been added. Prior to 1973 the 'stock' valve would not have allowed as much gas into the venturi. The new valve allows more fuel, better cooling and longer valve guide life. It would be a good thing to check because this extra flow of fuel is coolant and it flows best when the throttle is fully opened.

As we pass through 500 feet above ground and reduce the rpm, we will be looking outside for traffic unless we are IFR and in instrument conditions, at which time we will be settling down on the gauges with a scan that will include engine instruments. VFR, we include the engine instruments in our scan of the world outside. Climbing from 500 feet through the airport traffic area, we want to be sure that engine temperatures are stabilizing. High oil temperature, high cylinder head temperature or abnormally high exhaust gas temperature warns us that we are not getting cooled off or that we may have an engine that is about to fail. We get the nose down, check that the cowl flaps are open, make sure the mixture is full rich and plan a return to the airport if the temperatures continue to rise or if they don't return to 'normal' settings.

We will lose one inch of manifold pressure for every thousand feet as we climb, and at some altitude, about 3,000-4,000 feet above the ground, we will reach what's called critical altitude. At

this altitude we will be operating at 24 inches, or 75 percent power, with full throttle. At critical altitude we will leave the throttle full forward and adjust the prop to set up our climb (2450 rpm) or, if we are going to level off, we set up a cruise rpm (2000-2400) and roll the trim tab two turns nose down. That's all there is to it: We leave the throttle forward. If we want to cruise below critical altitude (or when we have more than 24 inches of manifold pressure), we pitch over, hold pressure against the control wheel as the airspeed rises, and then trim two complete turns of the trim wheel nose down. Hold it there, wait for the airspeed to stabilize and then slowly reduce the manifold pressure and the rpm. We make changes in pitch and power slowly so we won't have to do everything all over again as the airplane accelerates. We move the power levers slowly to let temperatures stabilize. Then we close the cowl flaps and adjust the mixture if necessary.

We ought to practice takeoffs as diligently as we are inclined to practice landings. A smooth and deliberate departure will help us keep engine temperatures under control, give us plenty of time to look for traffic and help to calm jittery passengers. The Skylane is capable of high-performance rocket launches and it is tempting to show our stuff once in a while, but we will have to sacrifice cooling, visibility and public relations to do it, and most of the time the people we want to impress aren't interested in our little air show anyway.

When we use flaps to take off, things work a bit differently. The Fowler flaps are very efficient at creating the lift of a larger wing or a wing with greater camber. With 10°-20° of flaps deployed, the Skylane is capable of a very short ground roll. A short ground roll is useful when we want the airplane up and out of tall grass, mud, ice, snow or bad runway conditions. But with a shortened ground roll comes a lot of cockpit work to re-establish the airplane in a normal climb. At slow speeds, 10° or 20° of flaps produces lots of lift, but flaps produce more drag than lift

as we begin to accelerate. If we have apartment houses one mile off the end of the runway and a restriction to clear these buildings by 2,000 feet, deployed flaps won't help us climb. On the other hand, if we have the altitude restriction and lousy runway conditions, we'll have to use flaps to get us up and away from the runway, then gain some airspeed by pitching the nose down a few degrees as we lift the flaps, followed by another pitch up, this time to the best angle or best rate of climb. That's a lot of work to do when there are other things to occupy our minds, so we reserve flap deployment for the times when we need it to get away from a cruddy runway surface.

Whether we choose best rate or best angle to climb depends upon what we need to accomplish. If there is a power line at the end of the runway, we might decide to use a best angle climb speed (61 mph at gross weight) until we've cleared the obstacle, then pitch down to 88 mph, or best rate, as we complete the initial climb. With obstructions cleared, we want to pitch down further and set up for a cruise climb at 110 mph to get some engine cooling and vastly improve the forward visibility. We use best rate (88 mph) when we want the most efficient climb over a period of time, say to clear a ridge some miles from the airport.

When we are taking off at high-density altitudes, say El Paso, Texas, on a 105°F day, when that 4,007-foot runway will have a density altitude of 7,000 feet, or Leadville, Colorado (9,927 feet MSL), most any day, our mighty Skylanes will feel a bit wimpy. At full gross weight we will roll and roll and roll, but eventually (assuming there is runway available) we will gain enough speed to produce lift equal to our weight and we will climb. Again, the airplane's weight will not change the pitch attitude; it will only increase the takeoff roll. We will keep our nose down and climb at best rate unless there are trees or apartment houses to avoid; then we will climb at best angle, clear the obstruction, pitch down to best rate and climb. Once clear of obstructions, we will select

cruise climb to keep the engine cool and give us better visibility over the nose. The takeoff trim tab setting that works for us at home will work in the same way at Leadville or at International Falls in Minnesota, where density altitude may be *minus* 4,000 feet on a cold January day.

The mistake that we all make from time to time is to become comfortable with our airplane's routine performance and then, in unfamiliar conditions, become disturbed when the Skylane seems to perform in an unusual way. We can avoid the uncomfortable feeling that something's wrong by experimenting a bit. We need to experiment with density altitude, for example, to learn how our Skylane will perform at various weights and at various altitudes. Density altitude, as we recall, is a performance altitude. By that we mean when our Skylanes are operated in air that is nonstandard, colder or warmer, or at a pressure altitude other than sea level, the Skylane's performance will be different than what we experience routinely. In fact, most of the time we operate our Skylanes in nonstandard conditions, and we can benefit by exploring these conditions.

When we are visiting the mountains or the desert, we feel a lot more comfortable when we have handled our airplane in air that is less dense or warmer than what we routinely experience. The first time we take off from a high-altitude airport, we can become concerned when our engine puts out less power, our propeller is less efficient and our wings won't produce as much lift.

We can find out how our Skylane will feel at Leadville by climbing to the pressure altitude of 9,927 feet and working out a density altitude problem. The easiest way to do this is to start a cruise climb to 9,927 feet. On the way up, check the area's local pressure setting and write that down; we'll need it when we come back. Then turn the altimeter setting knob until the 'standard' pressure of 29.92 appears in the Kollsman window. When you arrive at 9,927 feet, that will be the pressure altitude. Stop the

climb by pitching over just a bit; it won't take much pitch over up here. Trim for level flight and then look at the outside air temperature gauge. Using a flight computer, line up the pressure altitude (9,927 feet) across from the temperature (50°F or 10°C, for example) and read the density altitude of 10,500 feet.

Our Skylane is now performing as if it were flying at 10,500, so let's see how it behaves. Push the mixture to full rich, push the prop full forward and pitch up to 10° on the attitude gyro. Make a note of your rate of climb. Notice how rough the engine runs. Now let the nose drop and sink back to 9,927 feet. Relean the mixture. Use your EGT and try to lean for best power. Hold your altitude a minute and let things stabilize; now pitch up again, 10° as if you were taking off. Note your rate of climb. If you didn't appreciate it before, you now know why we take pains to lean the engine at high altitude airports, and why we are patient to let the airplane roll further on the takeoff run. If you try to jerk the airplane off the ground at a density altitude of 5,000-10,000 feet, you may be rewarded with a very short ride in ground effect before you run out of runway.

Before you leave 9,927 feet, look at the manifold pressure gauge. That's pretty close to what you'll see sitting on the end of the runway at Leadville.

Now return the local pressure setting to the Kollsman window and note your altitude above sea level.

If you try this experiment with the airplane fully loaded and again when the airplane is light, you will have begun to experience the performance of your Skylane when you depart a high-altitude airport. The only thing that is missing is the view, and the view is often a nearby mountain ridge that's a thousand feet higher than you are. If you are planning a trip to the mountains and you are a flatlander like me, there are FBOs all over the Rockies who will fly with you in your Skylane and show you the protocols of getting along in the high country. Meanwhile, take a safe-

ty pilot who can watch for traffic, climb on up to the teens and do some routine air work. It will give you confidence in your Skylane and really impress you with its abilities in the thin air.

In the winter, or anytime the carburetor air temperature is 40°F or below, our Continental O-470s have an additional problem that will need attention. The carburetor on our engine is located away from the warm engine environment. This is a peculiarity of the Continental O-470, and all Cessna 180s and most Skylanes (except the 1980 turbo and RG models and the Lycoming-equipped Skylanes produced after 1997) use this engine. It's a great power plant with a lousy induction system. Because the carburetor is mounted some distance from the warm engine, the fuel/air mixture in the carburetor never gets warmed up. To properly vaporize a fuel/air mixture, the temperature in the carburetor, measured at the throttle valve, should be about 40°F (5°C). On a chilly day the ambient air may be colder than that, and the mixture becomes colder still when it cools during the vaporization process. By using carburetor heat we induct warm air into the throat of the carburetor, which improves vaporization.

The old-timers fly Skylanes with the carb heat on all the time in the winter. They start their engines, pull the heat on and leave it on until they have shut their engine down at the end of the flight.

You may have noticed the effects of this fuel vaporization problem when you pulled your Skylane from a warm hangar on a chilly day. When you started the engine it ran smoothly for a moment and then it seemed rough. The problem was that you started the engine with warm air inside the cowling, and then, when the engine was running and drawing chilly outside air through the air filter, the vaporization process went whacky and your engine was running very lean. You may also have noticed

that the engine seemed to run much better when you checked the carb heat during run-up. On sub-zero days you may have noticed that the power actually increased when you performed the carb heat check.

After 1978, Skylanes were equipped with carburetor temperature gauges, and the gauge is important if you want to use less than full carburetor heat. It is possible, by using less than full heat, to bring a very cold carburetor into the icing range of  $-15^{\circ}\text{C}$  to  $+5^{\circ}\text{C}$ , and that will get you into trouble quickly. You should not be operating a Skylane equipped with an O-470 without a carb temperature gauge.

By adding heat to the carburetor throat, we enrich the mixture. The heated fuel/air mixture contains more fuel than air. This enriched mixture decreases the power output, so we will need to lean the heated mixture by pulling the mixture control out until the rpm rises. Most Skylane owners discover that the engine runs more smoothly on the ground when the mixture is pulled out a bit. You might try this: Start the engine and let it run a moment. Then set the throttle at 1000 rpm. Now pull the mixture out, slowly, until the rpm reads 1100. Reduce the throttle to 1000 rpm and you have leaned the engine for ground operations.

The Skylane is a superb winter flying machine in spite of its induction system. We have very good cabin heaters; the cold, dense air adds to our remarkable takeoff performance, and our carburetor heat system is very effective. Let's take a quick trip on a cold Minnesota morning.

The city crew has just finished plowing the airport after an eight-inch snowfall the night before. The cold front passed after midnight, and we awoke to a  $-30^{\circ}\text{F}$  reading on the kitchen window thermometer. At 6 a.m. I plugged in the Skylane's Tanis Engine Heater and turned on a small 750-watt ceramic heater in 3135Q's cockpit. The air temperature in the hangar was  $-20^{\circ}\text{F}$ .

**9:00 a.m.** — I've opened the hangar door, pulled the Skylane out and climbed in out of the wind. The cockpit is toasty warm. I take off my hat, scarf and gloves and throw them in the back seat. I prime the engine seven strokes. I advance the throttle a half inch and turn on the master switch and the key. The O-470 starts. I pull the carb heat on. The engine runs smoothly, and I watch the windsock snap and shake on its fragile pole. 35Q rocks and rolls in the gusty, arctic December wind. With carb heat on full, I turn the vernier mixture control and lean until I gain 100 rpm. I reset the throttle at 1000 rpm and I let the O-470 warm for three minutes before I do the run-up. I want to see some cylinder head temperature and a little movement on the oil temperature gauge before I touch anything.

**9:10 a.m.** — The wind is really sliding the Skylane around on the icy run-up pad. I'm pleased that I thought to do the run-up on a patch of exposed asphalt back on the ramp. I call my departure and take one last look around the panel. I look at the carburetor air temperature gauge. The needle is just touching the yellow arc, about 5°C. I pull the carb heat control out just a bit further — less than a quarter of an inch — and the needle rises to 10°C. The mixture is set to full rich now, and I'll wait until I'm climbing and the engine power has stabilized before I lean.

**9:12 a.m.** — The Skylane leaps off the ground in a 20-knot gust of wind and climbs like a homesick angel in the dense -15°F air. My Shadin Fuel Flow Meter says I'm burning 20.2 gph. I turn the prop control back to 2450 rpm, leave the throttle full forward and monitor the EGT; I lean the mixture to 1450°F — 125° rich of peak. The Shadin quickly computes a reduced burn of 19.5 gph.

**9:17 a.m.** — 5,500 feet and climbing at 1,200 fpm, 110 mph; the outside air is -20°F. Carburetor temperature has slipped back to the yellow, 5°C; I pull carb heat out another quarter inch, wait for the temps to stabilize and then lean-further, maintaining

1450°F — still about 125° rich of peak. The Shadin says I'm burning 15.5 gph. My altimeter winds up like the second hand of a clock, and I level off at 8,000 feet where the outside air temperature is -22°F. As the engine speeds up, I reduce the rpm to 2300 and maintain full throttle, or 21 inches. I report 8,000 to Center and carefully lean to 1450°F on the EGT, which in this cold air turns out to be about 75° rich of peak. The fuel flow is stable at 14.1 gph. I trim, check my heading, check the next frequency and scan the engine instruments. Everything is in the green. I close the cowl flaps another notch.

**9:30 a.m.** — Steam is rising over the Twin Cities. Minneapolis Approach is busy and I am looking for traffic. I am stable at 8,000 feet, -25°F, 135 kts true, 21 inches, 2300 rpm, 13.5 gph. Exhaust gas temperature is 1450°F; carburetor temperature is 10°C. That's a lot of stuff to look at, and the power quadrant looks weird too, with everything sticking out except the throttle control. But the Skylane is purring in the cold air because I am using heat to aid the vaporization process in my carburetor. Because the vaporization process is efficient at 40°F, my fuel burn is about 2-3 gph less than it would be if I were flying without carb heat.

**9:41 a.m.** — Approach has given me lower, 3,000 feet. I enrich the mixture to 1425°F on the EGT, pitch one bar down on the horizon and reduce the manifold pressure to 20 inches. I enrich the mixture first because I will shut down the auto-enriching device when I pull the throttle back a half inch or so. I'm descending at 500 fpm, 140 kts IAS, cowl flaps closed, burning 12.5 gph according to the Shadin. I'll maintain 20 inches of manifold pressure as I descend, and I'll monitor the EGT, enriching to stay at 1425°. The carburetor air temperature will increase slightly as I descend into warmer air at 3,000 feet, but I won't adjust the mixture any further. Now I just fly the airplane, talk, and keep the manifold pressure at 20 inches. Rpm stays at 2300;

carb heat stays on. Everything on the engine instrument side is in the green. Flight instruments are stable and the trim is doing all the work; I'm just the eyes and brains of the outfit.

At 3,000 feet I pitch up, level off and retrim. I maintain 20 inches and show an airspeed of 110 kts. My fuel burn is clicking down to 11 gph. I'm cleared for the visual approach, and now very slowly, at a rate of two inches every two minutes, I reduce the throttle to 15 inches and start down at 110 kts, 500 fpm, 2300 rpm, 1425°F on the EGT. The Shadin shows a burn of 8 gph. The carb temperature has risen to 15°C, a bit high and rich, but I'll leave it alone and fly the approach. On final, I enrich the mixture to 1400° on the EGT, push the carb heat control in to achieve 10°C on the carb temperature gauge, throttle back to 1500 rpm, push the prop control forward and drop full flaps. I land at 10:15 a.m.

Off the runway, I pull the carb heat out three-quarters to maintain 10°C carburetor heat, and I lean the mixture to keep the engine running smoothly. The fuel flow monitor shows the Skylane uses 3.7 gph to taxi on a chilly winter's day with full carb heat and leaned. At the FBO I shut down but leave the master switch on long enough to toggle the 'fuel remaining' switch on the Shadin to see how much fuel I'll need to top the tanks. Shadin says 14.6 gallons. The line service technician puts 14.3 gallons in the airplane. I reset the fuel flow monitor to show 60 gallons, or full.

One hour and three minutes in the air, burning 13.6 gph. Not too shabby for a Skylane. In the past, flying in the winter without using carb heat en route, and unable to lean because the mixture was already too lean from the incomplete vaporization, I burned 15-17 gph in cruise. Erratic vaporization led to very erratic fuel flow, wild cylinder head temps, an EGT that never settled down and a lot of nether world engine noises. Without a warm induction environment, my Skylane was subject to damaged

exhaust valves and guides.

Winter flying the Continental O-470 properly requires a good EGT installation and a carburetor temperature gauge — with a probe installed at the carburetor throttle valve. Without these instruments the 180 or 182 pilot is just guessing about using carb heat. If you have to guess, use full carb heat. Partial heat can get you into trouble when carb temperatures are below freezing.

When the FAA certifies an engine, they certify to standards of maximum temperatures. There is nothing in the regs that says an airplane engine has to operate in minimum temperatures. When you fly the O-470 in extreme cold, you are a test pilot.

The Shadin Fuel Flow Meter is frosting on the cake. Metering fuel flow to a carburetor engine is the stuff of computers and sophisticated transducers (a kind of paddle wheel in the fuel flow). My Shadin has been so accurate that I am now leaning the mixture to a known fuel flow — backed up by a check on the EGT. My Skylane fuel gauges typically read 'E' when I still have 20 gallons of fuel in the wings. With the Shadin I'm flying longer legs with more confidence. With this new freedom, however, there is more responsibility. The pilot must check to see that there is really full fuel on board before telling the computer to work from that figure. I top the tanks myself if there is any doubt in my mind.

All of this fuss and added work load leads to a more comfortable cold-weather flight, more accurate preflight planning and fewer surprises at annual. Darrell Bolduc's the man who overhauled my engine, and he has overhauled the engines of many of the floatplanes and winter-flying Cessnas in the Upper Midwest. Darrell helped me learn how to fly my O-470, and he says he'll probably get less work when O-470 operators learn the secret of carb heat, but he would gladly trade that kind of work for healthier engines and happier pilots in the field.

## Chapter Eleven

Because we have the airplane trimmed for cruise climb, we leave the airport traffic area under control and motor aloft toward our destination. If we are VFR, we will climb to an altitude 'appropriate to our direction of flight' and, based on our weather gathering, an altitude where we may expect favorable winds. For those great days when we are just out flying, wandering from the airport to the river, along the river north to our favorite hangout, we pitch over at 1,000 feet above the ground and smoothly and gently reduce the manifold pressure to 20 inches and the rpm to 2200. We check out the EGT and carburetor air temperature. On a day when the outside air temperature is near freezing, we'll add some carburetor heat and lean for 1450°F on the EGT.

If we are IFR, we are busy flying vectors for Departure control, switching frequencies as we pass from one sector to another and scanning to see that we are climbing and that we are flying the assigned heading. We monitor the engine instruments carefully during these first minutes aloft, and if the atmosphere is disturbed we are thankful to be flying our rock-solid truck, the Skylane.

I fly the airplane, turn, climb, pick up my flight book and check in with Center. I get my clearance, write it down on the pad

that is clipped to the cover, and I check the clearance to see if Center and I are talking about the same plan. I enter a transponder code, put the book on the floor, and in a few minutes I'm in the clouds climbing to 10,000. I am climbing to my en route altitude, and I can clearly see myself ascending in my imaginary box. Because the Skylane is so stable, and because the elevator and trim tab have so much authority, I have not touched the control wheel since I turned to depart the pattern. I have turned the rudder trim about a half a turn, so I don't have to use right rudder all the way to 10,000 feet.

There are transitional times in the Skylane where we catch ourselves trying to maintain pressure on the control column or rudder pedals. We think 'we can hold it' for a few minutes, and then we become distracted by one thing or another, and sooner than we'd like to admit, our heading is off and our airspeed is wandering around. Whenever we allow the airplane to pitch up or down or bank or yaw, the movement of the wing is causing more difficulties. If we are trying to get comfortable in our seat and we accidentally push on the right rudder as we get our butts situated, the yaw to the right will overspeed the left wing, creating some additional lift and causing the airplane to bank to the right. If we aren't scanning just then, we may find ourselves 10° right of heading, turning and possibly slipping, which means we are losing altitude. Now we have to stop the bank, return to our heading, pick up the 50 feet of altitude that we may have lost, pitch over, hold the control against the trim pressure while the airspeed catches up and watch carefully while everything stabilizes again. I timed all of this nonsense once and discovered that it takes me about 30 seconds to fix a five-second excursion when I have been flying against control pressure. So we trim the forces away all the time, and when we are able we engage the autopilot, though in these chapters we will hand fly the airplane.

Center identifies me on radar and has no further clearance, but

gives me a new frequency to call when I reach 10,000. I enter the frequency on the stand-by side of the radio. The airplane is trimmed well for 110 mph and I'm climbing at 500 fpm. The engine instruments are where they should be, and I begin to lean the engine as the manifold pressure drops below 24 inches, or 75 percent power. I watch the EGT and lean for 1450°F. I check the carburetor temperature and see that as I climb into colder air the temperature has cooled off to 5°C. I want at least 10°C in the carburetor throat (the most effective temperature to achieve complete fuel vaporization) so I pull the carburetor heat control out about a quarter of an inch and wait. The carb heat has enriched and cooled the mixture. The EGT cools to 1425°F and I lose an inch of power. I wait. When the carburetor temperature is stable at 10°C, I relean the engine until the power I lost is back and the EGT is once again stable at 1450°F.

Passing through 6,000 feet, the Skylane is climbing as if riding a rail. I find the Skylane is so stable in a trimmed climb that I can devote full time to my scan and any bookwork that Center might cook up for me. It's a pleasant time and the pilot can take a few minutes to chat with passengers or work on domestic problems. Occasionally, 35Q will bump through a patch of disturbed air and the nose will rise a bit and then fall and rise again. These phugoid or 'long-period' oscillations are smooth and can be dampened by a slight pressure on the control wheel. Our Skylanes exemplify positive dynamic stability, or simply, our airplanes have an overall tendency to return to the trimmed condition after a few excursions in pitch. This longitudinal stability is engineered into the Skylane by designing the airplane with the center of gravity well forward of the center of lift, and by using a large horizontal stabilizer, at a slight negative angle of attack and with an inverted airfoil, placed at some distance from the center of gravity.

If we used a playground teeter-totter to demonstrate what

happens, we would put our 530 pounds of engine and propeller on one end of the board and then imagine how much force it would take to push the other side down. It would be easier if the engine and prop were located on a very short length of board and the other end was quite long. If we think about it we can imagine pulling the engine up with one hand on the long extension of the teeter-totter. The long end of our aerial teeter-totter is the tail, of course, and the force applied to the tail is a downward load caused by an inverted airfoil, which is producing a down force of lift. We can imagine, then, that if we were to chop the power in trimmed, straight and level cruise flight, and thus reduce the lift on the wings, the forward center of gravity would cause the nose to go down. Now the airplane is descending, the airspeed rising. But the Skylane's huge horizontal stabilizer, with its trimmed elevator, is reacting to the increased airspeed by creating inverted lift, or what we call a tail load. As the airspeed increases beyond the trim speed, the tail is forced down and, of course, the nose rises. The opposite happens when we pull the nose way up and then let go of the control wheel. The nose comes up, the airspeed decays, the tail loses its 'authority' or force and the nose falls. The descending airplane picks up speed, the tail gains authority and the trimmed elevator pitches the nose up until there is not enough lift to sustain the climb; then the tail 'unloads,' the nose falls and down we go again. A dynamically stable airplane like the Skylane dampens these oscillations so that each excursion, or phugoid, is less exciting than the previous climb and dive until, finally, our airplane motors along, level, at the trimmed airspeed.

It's worth the time to put a safety pilot aboard and climb 3,000-4,000 feet above the ground, clear the airspace and try this: Set up a trimmed flight at 80 mph, pull the nose up and keep the wings level until you hear the stall warner. Then let go of the control wheel and watch what happens. Count the oscillations, keeping the wings level. Now try the same maneuver by using power.

Fly level, trimmed at 80 mph, and give the engine a short burst of power. Because the Skylane has a thrustline below the center of gravity, the nose pitches up. This stuff is nice to know on a dark and stormy night when your approach to the runway has to be aborted and you apply full power with an approach trim speed. While you are at altitude, try level flight, trimmed at 80 mph, hands off. Now we are going to lower the flaps. Lower the flaps  $10^\circ$  and watch what happens to the nose; then try  $20^\circ$  and finally  $40^\circ$  of flaps. Watch what happens. The nose pitches up, and you'll need to hold some forward pressure. Our Skylanes are designed so that when we use those huge barn-door Fowler flaps, the amount of wing surface producing lift is greater and we can fly safely with less airspeed to achieve the same angle of attack. Our wing stalls at a specific angle of attack — about  $18^\circ$  — at any airspeed. When we fly an approach and break out and see runway ahead, we now know how much forward pressure we'll have to exert on the control wheel at each flap position to maintain our approach airspeed. This 'ballooning' of the Skylane will decrease as we bring the power back, so it isn't necessary to change the trim setting, as we'll see soon in the chapter about landing the Skylane.

Try different power settings in level, trimmed flight to see how thrust is related to longitudinal stability when the thrustline is below the center of gravity. It's interesting and it will be helpful one day.

I'm sitting back during the climb, monitoring the engine instruments as a part of my flight instrument scan. I will not let anything get far from where it should be. I use the rudder trim to offset the left-turning tendencies in a long climb, but my feet stay on the rudder pedals to maintain the heading. The elevator trim is doing all the pitch work.

My job is to scan. To manage. To plan ahead. Dave Moran

once told me that the pilot should always know the next two things that will need to be done and have an emergency scheme plotted for every phase of the flight. Since I have been using this advice, I haven't yet been caught short of information by a crisis. I don't think about what could go wrong anymore because I have a plan to deal with it. If the engine packs it in just now, I pitch up to the best L/D at my current weight (2,300 pounds), which is 73 mph, turn to a heading that will get me to the departure airport, open my flight book to the 'departure' page, pull the approach plate and call Center and *tell* them what's happening. I'm not going to ask anyone for a clearance or change codes or do any office work until my airplane is stable, descending at the proper rate and pointed at an airport. Center will have to move other traffic, Center will do the office work, I fly. I will turn to the 'emergency' tab in my flight book and pull the factory checklist. Then I put my book on the floor and I'm a full-time pilot until the crate is safely on the ground.

I break out at 8,500 feet and I'm climbing in the sunshine. What a beautiful way to go to work. At 10,000 I pitch over slightly, put the bar on the horizon and let what's left of my thrust give me some airspeed. I roll another full turn of trim forward and wait for the Skylane to catch up. I switch frequencies and call Center and say, "Minneapolis Center, 3135Q level at one-zero thousand, ten thousand." Center acknowledges my call and I open a can of Coke (watch out above 10,000, or everyone gets wet), pick my flight book up off the floor and write down the climb time and fuel burn for future reference. I'm in the clear at 10,000 so I keep an eye out for traffic. Center's in charge of aircraft separation, but I'm the one who will get hurt if two of us get close enough to trade paint up here. So when I'm on an IFR flight plan in VFR conditions, I look outside.

Level at 10,000, I've got 18.5 inches of manifold pressure and

2200 rpm. I'm nuking gas at the rate of 11.2 gph, getting a true airspeed of 143 mph. I flip the switch on my Shadin Fuel Flow Meter and see that I have burned 4.5 gallons during the 15-minute climb. The OAT is  $-5^{\circ}\text{C}$ , or  $23^{\circ}\text{F}$ , and the carburetor temperature is  $15^{\circ}\text{C}$ . I push the carb heat control in about a quarter of an inch and wait. The needle settles on about  $12^{\circ}\text{C}$ . I releant to an EGT setting of  $1460^{\circ}\text{F}$ , about  $50^{\circ}$  rich of peak, which seems to work well at these low manifold pressure settings. I'm operating at about 60 percent power, and my book figures say that I ought to be getting a fuel burn of 10 gph. I show 11.3 gph. I check the gauges. My rpm setting isn't quite 2200 rpm. It's more like 2275 and my manifold pressure is a bit higher than 18.5. I make a reduction in rpm and wait. The fuel burn goes down to 10.8.

In general our manifold and rpm gauges are accurate, and after 30 years of use they are definitely more accurate about one thing or another than I am after 40 years. But they need to get checked out if we are going to tweak power settings. Tweaking just a bit may make the difference between a couple of gallons an hour for us and long engine life or burned-up cylinders and warped exhaust valves. Tweaking, making small corrections to get everything just exactly where we want it, is pilot stuff. This is what we do to earn the fancy title and walk around with wings on our lapel. It may seem a bit overboard to check a flight against a previous flight or book figures, but it teaches us a lot about our engine and the atmosphere and, best of all, it gives us a rush — a real sense of satisfaction that we are in control.

When we fly, we try to put good feelings, satisfaction and our little successes in the bank.

We need to feel good about what we are doing and positive about the next phase of the flight. If something goes wrong, we will have to draw on that reservoir, or bank account, to stay pumped up to get the problem solved. There is nothing that takes

us down the tube to disaster faster than a lousy attitude — unless it's a knowledge deficit. And a lack of knowledge or information is what causes us to despond in the first place. Knowledge is the real power plant when we fly an airplane. We can fly our Skylanes to a safe landing without an engine, but we're dead geese without knowledge. Knowledge about our airplane and its systems and the atmosphere and navigation can be had by anyone who will take the time to prepare and by anyone who recognizes that every time we fly, we will learn something new if we are thinking and open to the information.

We are pilots. We are in love with control, but we dislike the discipline it takes to become knowledgeable. We can be quite lazy. When we learned to fly we got on well with the phases of training that required us to push that and pull this because we could see the results right away. If we bank too steeply the airplane loses lift and we need less of a bank angle to maintain altitude. We accept that because we can demonstrate it. To spend a night with a book, however, even a classic like *Aerodynamics for Naval Aviators*, dredging up our rusty trigonometry skills, is not our idea of being a pilot — until we come up short on the demonstration one day and need the information. Our old and gray instructors have told us that we can depend on coming up short during our flying careers, so we should spend the time while we are still breathing to get the answers. Most of us will nod yes, and most of us will never read the book.

So what I have to do is turn every flight into a little classroom. I pull this and push that and write down what happened. If I am not getting the same performance at 10,000 today that I got yesterday, then I start looking for the reason. It's like lab during our days in high school when we made the whole building reek with the smell of sulfur. It's a gas to learn (sorry); it's fun and we learn while we are having fun. If I keep accurate notes about my air-

plane's performance during a flight, I am engaged, alive, alert and a pilot.

One of the turns in the road that can take us on a very short path to destruction is marked 'businessperson/pilot.' I'm one of those people. Most of my flying is related to my business. I can sleep well, be refreshed and jump in the airplane and fly 200 miles to a luncheon meeting. I do business for three hours, jump in the Skylane and fly to another customer before I head home for the day. If I were doing my business in a car, I'd never be home. But I live this Jekyll-and-Hyde life. I'm a pilot for two hours, then a business guy, then a pilot and then a business guy again. Finally, at the end of the day when I'm tired and wanting to go home and be with Jeanne, I have to be a pilot again. The airplane and the atmosphere and the ATC system are just as demanding of me at the end of the day as they are in the morning when I'm fresh. So I have to find a way to switch from being one kind of person to another at the turn of a key. My flight book is organized to draw me away from my earthly worries, my earthly business and my unhealthy, and sometimes unearthly, luncheons and into the aviator's realm. If I play the game that my book outlines, I will not perish in 3135Q unless somebody who isn't using their book falls on me. If I decide that everything's working okay and I forgo the book and turn on my mental autopilot, I have just checked out of the pilot loop and 35Q has just picked up another passenger in a pilotless airplane.

Autopilots can take us out of the loop too. We set the pitch, trim and engage. For a time we are good managers. Then we push our seats back and stretch out a bit. We fill our cup with coffee and talk to the passengers, watching our little family of instruments, listening to a weather broadcast, acknowledging Center and sometimes walking along the very thin line that separates pilots from passengers.

Several years ago I flew from Florida back to the northcountry in a new Piper Malibu. I was sitting in the left seat and an old pro named Willis Faux was in the right. We departed the Vero Beach area and zipped up to 20,000 feet where we engaged the King KFC-150 autopilot, which was coupled to a King K90B GPS. Willis gave me some instruction on Malibu systems while we cruised along at 220 kts, answering call-ups from Center, drinking coffee and eating rolls. Our plan was to fly direct to Nashville, where we were going to stop for gas and lunch. As we droned along, Willis scrunched down in his seat and, in a moment, appeared to be asleep. Fine. I had the Malibu to myself. About 10 minutes later, we got a call from Center giving us a hand-off to another sector and telling us to expect descent at pilot's discretion to 17,000. Before I could engage my push-to-talk and acknowledge the call-up, Willis had moved forward in his seat, answered the call, tuned in the new frequency, checked on with Center, looked at me, pointed down and slumped back in his seat, asleep. For the rest of the day, as we flew on to Iowa, Willis 'relaxed' and handled the radio. He never missed a call. I asked him how he did that. He just shrugged his shoulders and said, "I'm not sleeping. I guess you could say that I'm relaxing. You take the opportunity when you can. When I'm flying with another pilot, I can let myself relax. You can't do that when you're flying alone."

But pilots have fallen asleep at the stick. When you are at altitude, sitting in the sun above a vast deck of clouds for three hours, listening to the rhythm of the engine, it can be hard to stay awake. I have whacked my head against the window more than once when I have thought that I might nod off. I've opened the window and let cold air fill the cockpit. I have emptied a thermos of coffee trying to stay pumped, and all that coffee probably saved my butt by forcing me to land so I could use the restroom. The only way I can defeat the metronome of the engine is to

change the rpm once in a while, and I can beat the sun by loosening the seat belt and harness and moving around a bit, stretching and doing a minor set of isometrics. Center can help, and you will hear this at night when lonesome pilots strike up conversations with lonesome controllers.

What we want to do is get enough sleep to conduct a flight. We want to be in good shape and have a positive attitude about what we are doing at the moment and a plan for the next two things. Looking up the next sector's frequency or checking off the air and calling Flight Service for an update on the weather keeps us alert for a few minutes. Sometimes we have to work at it.

So I use the time in the airplane to do pilot stuff. If I have a chatty passenger, fine; we'll talk until I get busy and then I'll clamp my David Clarks on and nod and smile and do my stuff. If the passenger becomes annoying I tell them that I'm a bit busy right now, but I'd love to hear all about it on the ground. If I'm IMC and hand flying an approach, which to an innocent right-seater doesn't look like much work, I have had to smile and say, "Excuse me, but you're going to have to be very quiet until we are on the ground — thank you." I brief my passengers before we depart. I tell them that it is going to be fun and we will go like the wind, but there will be times when I will not be able to pay attention to the conversation. Don't take it personally.

If passengers seem to have an interest in the flight, I use their stenographic skills to keep my performance charts up to date. I tell them that every 15 minutes they should write down the time, altitude, fuel on board (they love to toggle the switch), manifold pressure, rpm, carburetor temperature, outside air temperature, EGT, airspeed, groundspeed and fuel burn. Most people can do this well for an hour, and then they take a nap, but some of the best data I have about 3135Q's operations have come from the pens of passengers. Two of them became flight students. One of

them will never ride in the right seat again. "You have to work up there!" she whispered to a friend later.

One way to stay awake and get back into the pilot loop right now is to see some spooky weather ahead. We've gone to a lot of trouble to preflight the atmosphere and compare the movement of weather systems to our en route box, and we will have a comfortable flight when we encounter a disturbance that we expected. It's when the outside air temperature begins to click down suddenly, and the drizzle on the windshield turns to slush, that we sit up and want to make a new plan.

## Chapter Twelve

If anything can make a pilot's mouth go dry and stop the conversation in a cockpit, it's a weather forecast that has soured suddenly en route and produced unexpected trouble. The rain that turns to slush on the windshield, the lightening dead ahead, the nibble of turbulence that suddenly explodes beneath the wings and throws the airplane into a steep bank — this is the stuff we'd trade our little lapel wings to avoid.

Look at this forecast produced by a Center meteorologist:

A SLOW-MOVING COLD FRONT EXTENDS FROM THE ST. LAWRENCE RIVER VALLEY ACROSS SOUTHEASTERN MICHIGAN TO NORTHERN ILLINOIS TO CENTRAL MISSOURI TO NORTH-CENTRAL TEXAS. THE FRONTAL ZONE IS THE FOCUS FOR A BROAD AREA OF INCLEMENT WEATHER. ON THE NORTH SIDE OF THE FRONT, IFR CONDITIONS, WITH SNOW, PREVAIL FROM THE ST. LAWRENCE RIVER VALLEY TO THE LOWER GREAT LAKES, ACROSS THE LOWER MISSOURI RIVER VALLEY TO THE SOUTH-CENTRAL PLAINS. THE SNOW CHANGES OVER TO A WINTERY MIX ALONG THE FRONT, THEN TO RAIN SOUTH OF THE FRONT. THE FRONT IS STRONG ENOUGH TO TRIGGER SCATTERED

EMBEDDED THUNDERSTORMS FROM THE LOWER MISSISSIPPI RIVER VALLEY TO THE LOWER OHIO RIVER VALLEY. THE THUNDERSTORM ACTIVITY IS EXPECTED TO WEAKEN LATER THIS EVENING. HOWEVER, THE BROAD AREA OF INCLEMENT WEATHER ASSOCIATED WITH THE FRONT WILL NOT IMPROVE, BUT WILL EXPAND AS THE WHOLE SYSTEM SLOWLY INTENSIFIES DURING THE DAY.

What should get our attention during a weather briefing is the word 'slow-moving.' A slow-moving cold front means that a lot of cold air and a lot of warm air are expected to meet somewhere and fight it out. A cold front that drops down into Montana and North Dakota from Canada can move right along, be quite dry and earn the title 'fast-moving cold front' until it swings through Missouri and begins to pick up Gulf moisture. Loaded with moisture and running into the solid warm air of the deep South, it slows down and produces large areas of bad flying weather. As the forecast mentions, the frontal zone between the two air masses is going to pollute a broad area with 'inclement' weather for quite a long time. While the frontal zone produces rain on the eastern warm side and snow on the western cold side, the results of this clash, clouds, may build, stack up and become convective along or ahead of the frontal boundary and produce thunderstorms. If the fronts remain locked in battle, a stationary front may form, spewing ice and snow north of the front and rain and fog south. A stationary front can hang around until another system arrives and moves it, or the front can occlude close to the low pressure center when another blast of cold air overtakes the warm front.

If I were going to build a motel for stranded pilots, I'd build it in Chattanooga, Tennessee, for it's there on the 35th parallel and the 85th meridian that the northern cold fronts of winter and

early spring often lock horns with the sweet, moist, warm air of Dixie and form stationary fronts. If the front is more than a couple of days old, the low IFR weather can back up deep into Illinois, creating 300-400 miles of icy clouds on a busy route between the sandy beaches of Florida and wind-swept plains of the North. The bad weather can be broader than the range of our SkyLANEs, and even if we are comfortable with a low IFR takeoff and overflying airports en route that are far below minimums, we'll get skunked at the end of our range by not being able to find a legal alternate. We want a lot of gas to fly stationary fronts — and a lot of experience.

The Aviation Weather Center in Kansas City, Missouri, and its sister, the Storms Prediction Center, produce the convective sigmets and the convective outlooks that we retrieve when we get a computer weather briefing. Here's the Storm Prediction Center's explanation of the forecast above; a translation follows:

Convective outlook: ... MS VLY/CNTRL GULF COAST STATES ... WAA AHD OF RAPIDLY MOVG SFC FNT SHUD AID IN CNVTV DVLPM T EARLY DURG THE OTLK PD. AS AMS DESTABILIZES AND CDFNT ACCELERATES EWD ACRS LA INTO THE LOWER MS VLY ... SQLN IS XPCD TO DVLP AND PROPAGATE E/NEWD ACRS THE LOWER MS VLY/GULF COAST STATES. GIVEN AMOUNT OF INSTBY ... SFC LI/S ARND MINUS 2 ... K INDICES NR 30 ... STRENGTH OF FCST WIND FIELDS SUGG PTNL FOR SVR TSTMS WITH DMGG WIND GUSTS AND PSBL ISOLD TORNADOES.

Translated, this convective outlook reads: Mississippi Valley/central Gulf Coast states ... . Warm air advection ahead of rapidly-moving surface front should aid in convective development early during the outlook period. As air mass destabilizes and cold front accelerates eastward across Louisiana into the lower Mississippi Valley ... squall line is expected to develop and

propagate east/northeastward across the lower Mississippi Valley/Gulf Coast states. Given the amount of instability ... surface Lifted Indexes around minus 2 ... K indices near 30 ... strength of forecast wind fields suggests potential for severe thunderstorms with damaging wind gusts and possible isolated tornadoes.

Wow, what do we do with that information? It's a picture — it's a dynamic picture. It's like a little clip of animation that shows a front moving. There's warm air moving in ahead of the front, and the meteorologist thinks it may contribute to the convection that will be created as the front pushes air up. Because this lifting of air is happening along a channel that will retrieve Gulf moisture, the instability of the lifting process is going to cause big thunderstorms and a lot of wind.

Shortly after sundown that day, Atlanta Hartsfield closed runway 9R when a DC-9 ran afoul of a microburst and rolled off the end of the runway:

ATCSCC ADVZY 006 ATL/ZTL 01/27/96 ATL UPDATE

ATCSCC HAS EXTENDED THE GROUND STOP TO ATL UNTIL 0130Z. A DC9 HAS RUN OFF THE END OF RWY 9R, CLOSING THE RUNWAY. THE MICROBURST ACTIVITY IS STILL IN THE AREA. THIS INITIATIVE COULD BE EXTENDED.

And then, a few hours later:

ATCSCC ADVZY 007 ATL/ZTL 01/27/96 ATL UPDATE

THE ACFT AT ATL IS OFF THE END OF THE RWY IN THE GOOD OLE GEORGIA RED MUD. NO EST AS TO HOW LONG IT WILL TAKE THEM TO MOVE THE ACFT. MICROBURSTS ARE STILL IN THE AREA. ATL WILL BE A SINGLE-RWY OPERATION WHEN THEY START ACCEPTING ACFT. USERS CAN EXPECT EXTENSIVE DELAYS.

Unless we carry a meteorologist around with us, our preflight weather briefing is going to be the best information we'll have to understand the atmospheric changes that we may experience during our en route flight. The preflight briefing, whether we get it by modem and computer or by telephone from a Flight Service briefer, will alert us to conditions that may develop along our route of flight, threatening the peace and quiet in our 'box.' When we understand the weather system that affects our routing, we can more easily 'picture' the sudden buildups or the reports of ice. When we go into the flight without a thorough understanding of the weather systems along our route, it's hard to make any sense of a convective sigmet for thunderstorms. Without preparation, our flight can turn into a game of dodge 'em and we won't have the advantage of the long view to see what we are doing.

In a few years we will be flying with weather uplinks from the ground, showing us pictures of frontal activity and giving us access to stability charts, convection and icing reports. In the meantime, we can look out the window for some clues. If we are flying IFR on top of a scattered layer of cloud and the layer seems to be closing up and going broken or solid, we need to look at the sky ahead. If we are flying in between layers and the layers seem to grow dark and menacing as they meet in the distance, chances are that we are flying toward a low pressure center. If this is true, we ought to be correcting for a wind that is getting stronger from the left. If the sky ahead is blue or we see a layer of cirrus coming in from our left, we are probably flying with a low pressure to our left at some distance. We ought to be experiencing a light tailwind if this is true. If we are flying to the right of a low pressure center and the sky looks very bad out of the right window but brighter to the left, we should be experiencing strong headwinds.

Once we know where the pressure systems are and where the associated fronts are reported, we can imagine, with some accu-

racy, the effects on our flight. If we are experiencing effects (increasing headwinds, turbulence, multiple layers) that we did not expect or were not forecasted, then it's time to ring up En Route Flight Advisory (122.0) and get a briefing on the change. If we do this early enough, we will have a wide variety of alternate plans available, and most of the time we can get to our destination. If we wait, hoping things will improve, we will have a very limited selection of options, and we may well end up looking for any port in the storm. And that is bad piloting. The closer we are to a low pressure center, the more confusing the cloud patterns. It can get very chaotic-looking and uncomfortable, so if we don't have a clear picture of what's going on, it's time to get quieted down and find out what's happening.

Sometimes we feel an uneasy pressure to go on, even as the weather gets worse. Our mouth gets dry and we stop talking to our passengers. We are irritated easily and we may even feel a little panic. We can't seem to hold a heading or an altitude, and we may miss radio calls and forget simple things like altitude assignments and clearances to descend. We are flying on the edge of our confidence. We need to settle down and recognize that we have been surprised and that we will need more information to continue. If we can't get enough information from Center to give us confidence, we'll need to ask for an approach at the nearest ILS and land. Once we have made the decision to land, we will feel better immediately. In fact, we will feel so good that we may even think twice about landing. Land. The accidents happen when we press on, uninformed, making many small errors in judgment until we are in a position where even experience and superior skill can't rescue us.

"Flying safely," Jim Tompkins told me, "requires informed confidence and relaxed concentration."

What Jim was pointing to is a tendency for all of us to barge on ahead into the unknown with a certain bravado that is actual-

ly brought on by insecurity. It's easy to confuse confidence with bravado when we are walking out to the airplane with our passengers. If we are a bit nervous, a bit on edge about our plan, all too often we board, fire up, push the throttle forward and get into the fray, rationalizing that we can work things out on the way. Informed confidence is not bravado. When we take the time to prepare and are cognitive of conditions within our box, we feel comfortable — and that comfort is based on knowledge. Relaxed concentration is simply a state of preparation. If we know what control pressure will yield a certain airspeed, we can apply that pressure in a relaxed way and find ourselves concentrating on the results.

Student pilots soon learn that the most difficult part of flying an airplane is making informed decisions. We need to know what is happening in order to make the right correction. When students drift to the left of the runway as they flare to make a landing, they need to understand the left-turning forces before they will 'learn' to apply right rudder. And we face making informed decisions for the rest of our flying life. When the engine fails en route or ice appears on the windshield, there are any number of things that we can do first. What happens next depends on how fast we are able to shake our denial that anything has happened and how fast we can relax and fly the airplane at the correct airspeed, on a heading, while we either get to the checklist that will lead us through the litany of emergency procedures or get on the radio to request another altitude and icing reports.

At one time I thought all of this stuff sounded like too much work. I practiced my landings and practiced my climbs and descents, and when I got on the ground at the end of a workout I felt good. I felt like a pilot. Then one day I had the chance to watch some engineers fly a full-size drone. They started the engine, taxied the airplane, took off, climbed, maneuvered and

brought it in for a perfect landing. When you watch that happen, you feel a bit like a factory worker watching a robot do in a few seconds what it took you 20 years to learn. If piloting isn't making good landings or flying a perfect ILS approach, what is it?

What's left?

The airplane has no brain. That's all the pilot brings to the flight. We bring a plan; we bring the knowledge; we bring aboard the ability to make decisions to accommodate the changes. We are the managers of a small collection of engine parts, instruments and wings. And our flights are only as good as our management abilities.

When Jim says 'relaxed concentration' to me, I think of a cat lying for hours on end, not too far from a mousehole.

And I think that's how we fly our Skylane en route. Like the cat, we are relaxed, confident, at ease, restful, like Willis Faux. We have prepared and made a plan. General Dwight Eisenhower said, "In preparing for battle, I have always found that plans are useless, but planning is indispensable." Planning gives us confidence and knowledge, and when we have these, we can handle a problem.

Center has given me another frequency to call. I read it back, tune in the frequency and check on with the new sector. We fly our Skylanes through airspace that is maintained by Mother Nature and owned by the U.S. government, the military and local authorities. We are tourists passing through borders, presenting our papers, getting our clearances, abiding by local regulations and behaving according to local custom. We fly from friendly sectors to busy, curt sectors to places where the officials can be downright hostile. When we are IFR, we have certain diplomatic immunities that the VFR pilot doesn't have. We are rushed through complicated airspace, separated from other users and granted access to a larger system where there are fewer protocols

but greater responsibilities.

Controllers view our Skylanes as flibs. Little airplanes. Sometimes we are a nuisance that has to be mixed in faster company; sometimes we aren't mixed at all but taken aside and 'parked' until we can be mixed. But when you look at a controller's radar screen, you note that we are represented by a patch that is every bit as large as a 767. We are slower and we don't mix as well with the jet set, but we are as big on the screen as anyone. How we are handled, how much 'immunity' we will enjoy, is dependent on our behavior. If we are on an IFR flight plan but not managing our flight according to the general protocol or the local custom, we are likely to attract attention and become a problem. Once we have been identified as a problem, we may find ourselves getting a lot of attention, from sector to sector, until our behavior is no longer remarkable.

If we screw up an altitude assignment, can't seem to hold a heading, can't get a clearance read back without mistakes or are nervous and start using words and phrases on the air that are in contrast to the local custom, we become suspect. The controller looks at our patch and winces. Like the diplomat who arrives at a border with a document of immunity that no one has seen before, we will be moved aside and 'handled' until we are thought to be safe.

The Federal Aviation Regulations are the law. The *Aeronautical Information Manual* is the pilot's book of protocol. We abide by the law, and we learn the protocol and modify our behavior at the border according to local custom.

We don't fly in the system by arguing with controllers any more than a diplomat will argue a point of international law with a border guard carrying an Uzzi. Border guards and controllers are front-line soldiers, protecting a territory and its inhabitants from danger. When we enter a sector IFR, we are considered professional and competent until we prove otherwise.

When we are VFR, we are tourists. We enjoy no immunities. We can fly high in the government's airspace and cross borders by getting permissions from the border guards, but we will not be granted protection. We are not considered a part of the flow of the system, but simple transients who will be assigned a tour guide until we have left the sector.

When we fly VFR outside the system, we are on our own. I can climb to 16,500 feet (altitude reporting 'on' and squawking 1200 above 10,000 feet) and fly to California from Minnesota, VFR if I want to, and I can fly direct and never say a word on the radio. I will simply be an unconfirmed target that drifts across the radar screens at Minneapolis, Denver, Salt Lake City and San Francisco Centers. As long as I can maintain visual flying conditions (five miles visibility, 1,000 feet above and below the clouds and one mile from the clouds horizontally) and stay in Class E airspace, I'm just another happy little tourist causing a traffic call out to the IFR flights. If I get lonely, and I'm likely to get very lonely at this altitude flying into strong westerly winds aloft, I can call the local Center frequency and request flight following. The controller will give me a transponder code and, time permitting, he'll even call out traffic. If I behave, if my transponder works, if my \$50 intercom doesn't produce a stuck mike, if I manage to stay on the frequency and answer the calls, he'll pass me along to the next sector. It's a great way to fly.

The only reason I can think of not to fly this way is that Mother Nature rarely provides 1,500 miles of visual conditions in her lower atmosphere. On a good day we may have VFR conditions as we fly west to the Rockies, then a few hundred miles of IMC and visual conditions on the other side. We can file a VFR flight plan that changes to an IFR over some facility, pick up our clearance, which will be issued to some point down the road, cancel IFR when we are visual and go on about our way. It's a bit like asking the State Department to escort you through a troublesome

country. Lots of people fly this way because it's fun and because you can cancel flight following and drop out of the sky at any time and go to lunch. No schedules, no altitudes or headings to hold, just motoring along, sucking oxygen until your lips burn.

When you leave the oxygen altitudes VFR, cross-country flights can get more interesting. As you descend to 10,000 feet and below, you will be flying in more weather, the ride may be rougher, and you face a maze of Class B, C and D airspace for which you will need a plan. If you don't have charts to fly around these 'guardhouses,' you are in trouble.

You can also fly across this country VFR very low, a couple thousand feet above the ground, and you can do this without a radio. It's fun, and it can be relaxing once you get the hang of routing yourself around tall towers, mountains, Class B, C and D airspace, micro weather systems and all the other people who are enjoying free flight down low.

If you look carefully at a sectional chart, you'll notice that the military has claimed a lot of our country's open space for military training routes and planted some pretty big restricted areas around military terminals. Here, nape-of-the-earth military flights may be zipping around at Mach .085 at our altitude, giving us reason to look outside all the time, which is what we had better be doing anyway, VFR. We can legally fly through military operating areas VFR, but it can be a bit like hiking through a rifle range. Interestingly, IFR traffic gets routed around MOAs when the airspace is reported 'hot.' An IFR flight that doesn't want to take a 100-mile excursion around one of those cattle-country MOAs may cancel IFR, fly through the area visually, weather permitting, and then pick up an IFR again on the other side. It's all about protocol.

Flying in America today is a team sport. Whether we are playing on the floor with the boys or just trying to walk around the court to get to the refreshment stand, we are at the game and we

have rules and customs and just plain polite behaviors to follow.

Any ape can be trained to fly our Skylanes, and there are some apes out there flying, but when the windshield fills up with ice or with the 'N' number of another airplane, or when the lightening that was forecast to flash on our left starts flashing ahead of us, that's when, at 150 mph, 2.5 miles a minute and 220 feet a second, we have to have a plan ready to engage. That's when we tap the ape on the shoulder and tell him we've got the controls.

## Chapter Thirteen

We fly with a plan whether we are banking our Skylanes a few hundred feet off the deck looking for lost cows or hanging out with the Bonanzas, nipping on oxygen at 15,000 feet. Our plan is conceived on the ground, born once we're in the air and nurtured as the flight progresses. Our plan may be as simple as a climb to 500 feet on a northeast heading 'til we get to the Williams' place, where we'll turn north and start looking for the missing cows, or as complicated as a three-leg, all-day, IFR trip to the Florida sunshine. In either case, our idea of what will happen during the flight is preconceived as we raise the hangar door, modified when we get going and fine-tuned as the flight continues.

Rarely does our original plan survive in a recognizable form. We lose minutes and gain weight to accommodate a late passenger who arrives with 30 pounds more baggage than we expected. We lose time and fuel to accommodate ATC, who drops us down and vectors us around a busy Class B terminal before sending us back to Center, who clears us back up, levels us and bids us good-bye, 15 minutes off schedule with five gallons less fuel. When the humanoids are harmonizing with our plan, the atmosphere can hiccup, and while meteorologists delve into the mys-

teries of upper air dynamics and study the behavior of voracity maximums, we can find ourselves slugging it out in unforecasted, hurricane-force winds aloft.

In other words, some of the time our plans end up in the toilet and we are late or delayed.

Most of the time we get where we wanted to go in spite of our plan, and we get there in good shape with some fuel left over. When it works well we attribute the success to good planning. And good planning is simply spending the time before a flight to consider all of the variables that we are likely to encounter. We consider, for example, our passenger's propensity to be late for the flight, and we call him and tell him the airplane's leaving at 8 a.m. — sharp. If transporting this guy is the purpose of the flight, we plan a late departure. We study our routing and imagine the inbound traffic to a Class B terminal and decide to plan a dog leg around the place. We look at the weather map on TV the night before we launch and notice that a finger of warm air is forecasted to penetrate our route. We call the briefer for an update. The closer we get to launch time, the more catlike we are about the slippery elements of our plan. We nail them down because we know that unanswered questions on the ramp become the breeding ground for indecision once we are in the air.

As we gain experience flying, we learn what factors cause us the most trouble along the way and we focus on these wild cards, watching their behavior for signs of distemper.

But there are some rock-solid elements in our flight plan, and as usual they are neither human nor atmospheric. The Skylane is a machine, and if the machine is working properly and used correctly, it will produce the same results over and over and over again.

There is only one authoritative book on the Skylane, and we carry it around with us in the airplane. The book was called *The*

*Owner's Manual* until 1976 when Cessna adopted the General Aviation Manufacturers Association format, expanded the data, computed performance speeds in knots, tucked an equipment list in the book and called it the *Pilot's Operating Handbook* or *FAA-Approved Airplane Flight Manual*. After 1976 the POH became one of the documents that is required on board the airplane. For two years the flight manual's authority was tied to the model year, and then in 1979 the Cessna POH was issued to a specific serial number. The manual was current when it left the factory with the airplane, so if you happen to buy a 1976 or later model Skylane, you ought to be sure that there is a current and updated POH on board.

The 'owner's manual' that came with my 1967 Skylane contains 64 pages of information. The 1979 Skylane *Pilot's Operating Handbook*, or *FAA-Approved Airplane Flight Manual*, is a book of 332 pages. Many of the additional 268 pages are supplements advising owners how to use factory-installed equipment, and some space is given to a required equipment list that had previously come with the airplane's weight and balance data. But the 'big' POH also has a data-rich performance section that would be of interest to all Skylane owners. If you own an older Skylane, like me, you can write to Cessna and order a POH from any model year, and it's worth it to buy the softcover version of a post-1976 model, called the *Information Manual*, which contains all of the expanded performance data.

No matter what size POH happens to live in the glove box or seat-back pocket of your Skylane, it's cumbersome to use in flight. Although the POH contains the best information, the surest procedures and the most accurate 'numbers' for our airplane, we'll be in tough shape if we try to dig out the numbers in flight. We need to know the numbers before we launch. There's no quick way to do this, and we don't want the process to be too

quick because our POH is the syllabus for our Skylane home school. It is the basis for everything we need to know about our airplane from Skylane 101 to graduate-level study. We want our POH to sink in slowly, the data becoming real as we fly, and we want to compare what we've read with what happens in our airplane. When we have flown our airplanes for a few months and made copious notes, we have only to read the manual again to learn something new.

If we want to learn about our Skylanes, then, we want to pick a rainy night and read the POH. All of it. Cover to cover, noting especially the conditions upon which the performance information is based because these conditions tell us what information to gather during preflight planning.

The POH has data for three flight profiles: takeoff and climb, cruise, and descent and landing.

When we preflight for a trip, we use the POH to help us organize the conditions of a flight. The numbers for takeoff and climb are based on our weight, the pressure altitude of the airport, the temperature, the wind component and the runway length and condition. As we climb, our performance depends on our weight, the temperature and our climb speed. When we cruise we need to know the distance of the leg, the pressure altitude, our weight, the temperature and the forecasted winds. And when we descend to land, our weight is important and we need to know the temperature, the field length, the surface winds and the pressure altitude.

What we learn is that wind, distance, weight, temperature and pressure altitude are the critical variables to plan our Skylane's performance. These variables will affect how fast we go, how high we'll fly and what power settings we will use to get there. If we add dew points to our 'must know' list (at departure, en route and destination), we'll know a lot more about the weather en route, and if we throw in runway lengths, which is the sensible thing to do as well as a legal requirement, we'll know before we

launch if we can get off and if we can land when we get where we are going.

We begin to flight plan with a checklist in our personal flight book so we don't forget any of the variables. As we use the checklist, we will be surprised at how fast we adopt these factors in our preflight thinking, and soon we find ourselves flight planning without, for example, consciously figuring out the pressure altitude.

Pressure altitude is important and we need to understand it. Try this: Sit in your Skylane and turn the knob on the altimeter to the standard sea-level atmospheric pressure of 29.92 and read the altitude. Then change the barometer setting to 29.82, 29.72 and so on until you believe what you see. What you see is the altimeter changing 1,000 feet for every inch of pressure. Now try 29.92, 29.91, 29.90 and so on until you say, "Oh, yeah, I get it!" Then go home and take a hot bath and think about this: Pressure altitude is the basis of most of our performance tables. We use it with real-time temperature to determine density altitude, and we use pressure altitude to understand the effects of temperature and atmospheric pressure on our true altitude. Okay, example: Imagine flying along at 4,500 feet with an altimeter setting of 30.00. If you fly into an area of low pressure, say an area with a pressure of 29.50, the altimeter will sense the change (less pressure) and will creep up to 5,000. Think about that before you go on. The altimeter comes into an area with less pressure and shows a higher altitude. That's the way we want the instrument to work. That's what happens when we climb from the runway: The higher we go, the less pressure there is and the altimeter winds up. But if we are just flying straight and level, minding our own business, and motor into an area of low pressure, what's an altimeter to think? The altimeter doesn't care if the airplane is really climbing or not; it cares about the change in pressure.

But it's a problem for us because if we are about half alert and we see that we have climbed 500 feet, we'll probably push the nose down to maintain altitude. By making that correction, we are now lower than we think we are. How much lower? Well, if the original altimeter setting was 30.00 and the pressure in the low is 29.50 (1,000 x .50), we are 500 feet lower than we think. (Try this sitting in your airplane — on the ground.) Of course, this is a big problem if we are on an instrument approach to an airport that is smack-dab in the middle of a low pressure area and we forget to set the current altimeter reading in the Kollsman window. If we are on a nonprecision approach, we may break out of the clouds and find ourselves wandering around between tall towers long before we see the airport. It's a very confusing prospect for some hapless pilot on an ILS who is trying to understand why his glideslope needle is centered when his altimeter shows 500 feet above the glideslope.

The same thing happens when we fly into warmer temperatures. Warm air is less dense so the altimeter senses a climb, we push over, and splash. The opposite, of course, happens when we fly into denser air. The altimeter senses increased density and does what it is supposed to do, it unwinds. We find dense air when we fly from warm temperature to cold and when we fly from low pressure to high pressure.

Of course, if we are paying attention to the local altimeter setting as we fly en route, we are in clover. An instrument pilot who doesn't set the current altimeter setting before an approach is in really deep poop.

Pressure altitude, then, is a reference altitude, a standard. Our encoding altimeters transmit pressure altitude to ground-based radar, which makes the corrections for nonstandard pressure. When ATC asks us to report an altitude, they are checking that our altimeter is in agreement with the altitude data that they are

receiving from our encoder. When we fly at 18,000 feet and above, which we can do in early Skylanes, we set our altimeter at 29.92 and fly 'pressure levels,' or at a common datum with other aircraft above 18,000 feet. Pressure altitude is the standard that we use when we compute our airplane's performance and determine density altitude. And pressure altitude is a standard by which we can compare our POH data to the performance of our own Skylane.

Our engines are pressure- and temperature-sensitive. As we climb, we fly in air that has fewer air molecules and the fuel/air mixture becomes rich and produces less power. We can lean the mixture, but eventually, at some altitude, there simply aren't enough air molecules available to burn fuel efficiently enough to produce power. So the airplane stops climbing. We call that place the absolute ceiling. The service ceiling, on the other hand, is the place where the airplane can still perform — the engine will still produce power and provide enough excess thrust to climb — but the rate of climb will be minimal, like 100 fpm.

When we look at the cruise performance charts for the Skylane, we notice that Cessna builds its charts around constant altitude data. That is, the information is based on a variety of pressure altitudes. Other manufacturers, like Beech and Piper, use constant power charts to set up cruise settings based on the amount of power their pilots plan to use.

Cessna's pressure altitudes are likely to be presented (depending on the model year) in even altitudes from 2,000 feet to 12,000 (1979). My 1967 Skylane charts start at 2,500 feet and report data at 5,000, 7,500, 10,000, 15,000 and 20,000 feet. As mentioned, the numbers will be in knots after 1976 and in miles per hour during the earlier model years.

The earlier manuals computed the performance data using standard conditions (59°F, 29.92) while the later manuals expanded the value of the tables by giving the pilot data for three

separate temperatures. The later (1976) manuals also include a greater variety of conditions from which to draw your own power setup. If you own a pre-1976 Skylane, buying a manual from a later year is worth the few dollars expense to explore the factors that influence performance.

When we face a cruise performance table, we are getting ready to make a decision about how to set the power levers to get a certain result. We may be trying to fly the airplane at a specific percent of power, for example, or trying to achieve a certain fuel burn, airspeed, range or endurance. To make a decision about power settings, we need to know what we want to achieve. If our flight is to be conducted at 10,000 feet, where the winds may be favorable to push us along nicely and where our airplane will suffer less drag in the thin air and burn less gas, we may be interested in throttling back and going for endurance, thus staying aloft instead of landing for a time-consuming fuel stop. An endurance flight, by the way, can be very unpopular with passengers for whom even three hours is a long time to be 10,000 feet from a restroom.

It will cost us six gallons of gas to get to 10,000 and it will cost us some distance over the ground — although we don't lose as much as you might think, especially if we are climbing into favorable winds.

Assuming we have consent to torture the bladders on board, we look at the performance table under 10,000 feet and see that we have several combinations of propeller rpm and manifold pressure settings available to give us six hours aloft — that is, six hours in standard conditions with a lean mixture, with zero wind, at gross weight and, in some manuals, with no allowance for takeoff, climb and reserve fuel. My 1967 manual includes maximum-range figures that include the total useable fuel I can carry, so unless I get towed to 10,000 and plan to glide to my destina-

tion airport, I have to plan for takeoff, climb, descent and landing with reserves. You need to read the fine print in performance manuals.

For my trip at 10,000 feet I can use 2450 rpm and set the manifold pressure at 16 inches to achieve six hours with a fuel burn of 10 gph. I can also set the rpm at 2300 and maintain 17 inches and get 6.1 hours out of 9.8 gallons. And we can fly at 2200 rpm and 18 inches for 6.1 hours and 9.8 gph. So which do we choose? Why?

We are treading on near-religious beliefs here, but one 'sect' has it that you should always choose the low rpm and high manifold pressure settings. Members of this 'oversquare' faction believe that low rpm saves wear and tear on the crankshaft, rods and cam. They make claims for fuel economy, propeller efficiency (the slower the prop, the less energy wasted on noise) and lower exhaust gas temperatures at a given power output. With pressure in the cylinders, rings seal better, they say.

The other 'church' says run with high rpm and low manifold pressure because pressure in the cylinders will be lower and, therefore, there will be less stress and strain on the pistons and rings, connecting rods and crankshaft. This so-called 'undersquare' camp points to engine manufacturer power tables and says, "Thus it was intended."

For those who can't decide, there is a 'square' church and its dogma says climb until the manifold pressure is in the green (24 inches), then square the rpm (24 inches/2400 rpm). If you want to save fuel, reduce the manifold pressure and the rpm together (22 inches/2200 rpm). Radicals in this group have been known to fly a few inches undersquare (20 inches/2200) to save fuel and extend the range.

All three groups claim their engines reach TBO, plus hundreds of hours, and all sides agree that whichever theory you finally fly, you should always stay within the limitations estab-

lished by the engine manufacturer as shown in the Skylane's manual.

That said, we still have the option of selecting a wide range of rpm and manifold pressure combinations — within the manufacturer's limitations. I asked my friend Darrell Bolduc, a Skylane owner and engine overhaul expert, which 'church' he attended and why. Darrell believes in keeping the rpm high and squaring or undersquaring the manifold pressure. That is, Darrell might be inclined to choose 2300 rpm at 5,000 feet and select 21 inches to achieve 65 percent power. In his view the power pulses within the engine are closer together at high rpm and there are fewer pounding forces with low manifold pressure. So a shop might suggest keeping the rpm high and the manifold pressure low.

At 10,000 feet, we'll be flying with 19 inches of manifold pressure if we use full throttle, low enough to avoid 'pounding,' and we have a choice of rpm from 2000-2450. At 2450 rpm we will burn 11.9 gph and enjoy five hours of endurance. (Remember, five hours aloft is a pleasure that may not be shared by passengers.) At 2300 rpm we save eight-tenths of a gallon an hour and pick up 24 minutes of endurance. At 2200 rpm we save nearly a gallon and a half an hour (10.4 gph) and pick up 42 minutes of endurance. So reducing rpm from 2450 to 2200 at 10,000 feet saves us a gallon and a half an hour, increases our endurance by 42 minutes and costs us 8 mph in airspeed. If we could stay airborne for five hours at 2450 rpm, we would arrive at the end of our endurance 40 minutes before the Skylane flying at 2200 rpm, but the slow airplane would have enough gas left to fly another 40 minutes.

If we spend some time working cruise scenarios in the performance section of our POH, we can learn a lot about 'spending' power. We can buy comfort, low noise levels and fuel economy or we can buy speed.

Speed is expensive. On the other hand, that's one reason we fly airplanes — so we can go places fast. I used to go fast — although 'fast' in a Skylane is a relative term — until my wife, Jeanne, said she didn't like the noise and the vibration. What happened was she had finished reading her magazine on a recent trip to Kansas and was watching me establish a lower power setting for a cruise descent to the Lawrence Airport. At 2200 rpm and 20 inches of manifold pressure, pitched down one bar under the horizon, the Skylane is smooth as silk and sinks at 500 fpm with low noise levels and a fuel burn of about 8 gph.

"I really like this," Jeanne said. "Why can't we fly like this all the time?"

I explained that I was descending and that before we can go down, we have to have been up.

She sneered. "No, I mean it's so quiet and smooth, why do we have to fly so fast all the time? Can't we fly with less power and have a smoother flight?"

"Too slow," I said. "At these power settings it'd take us forever to get anywhere."

"Show me," Jeanne said.

When you have a wife like mine, you don't need to fly for excitement. So I pulled out the performance charts that night and was a bit startled to see that I had been hammering around the country at 2300 rpm and at 22-23 inches, which in my airplane produced 150 mph and a fuel burn of about 14 gph.

Looking at the chart I saw that I could just as well cruise en route at 2200 rpm and 22 inches and save about a gallon an hour for the price of 3 mph airspeed.

On the way back to Minnesota I climbed to 5,000 and set up 2200 rpm and 22 inches. Jeanne said nothing for a few miles and then she did what she always does. She looked at me over the top of her glasses, smiled and said, "Isn't this much nicer?"

I hate that, but Jeanne was right, as usual. My engine is very smooth at 2200 rpm, and 22 inches pulled us along just fine at about 145 mph, burning about 12.5 gph.

When I fly to Kansas from northern Minnesota, I can expect to cover the 426.3 nm in three hours, burning 36 gallons of gas with a little help from a northwest wind. When I have finished my business and I'm heading home, I'd be pleased to have a low pressure in western Kansas for a little push back to Minnesota. But I never get it when I want it, so I've tried to figure out how to fly headwinds with reasonable economy. Reasonable economy to me means avoiding a fuel stop and staying within my personal limit of an hour of gas on board when I land. If Jeanne's along I'm stuck with 2200 rpm, and I usually just slug it out for three hours plus 40 minutes, boring into the 20-knot headwind component with a burn of 45 gallons. I've found that I can save 15 minutes at a cost of two more gallons by increasing the manifold pressure to 24 inches.

If I spend a gallon and a half more, I can cut another 10 minutes by boosting the rpm to 2400 and maintaining 24 inches. The flight will take three hours and 18 minutes with a fuel burn of 48.5, which begins to flirt with my reserve.

Of course, we look at the winds aloft forecasts and pilot reports to see if there isn't a reasonable wind at a higher or lower altitude that will help us. Often, when we are heading into a northwesterly flow aloft, the winds within 2,000 feet of the surface will be westerly and less likely to slow us down. The reason for this is that the friction of the earth's surface tends to slow upper winds and turn them a bit to the right in the Northern Hemisphere.

The penalty, of course, is rough air, and if the crosswinds are stronger than 15-20 kts, the corrective heading we will fly (north-bound) to maintain our track will more than offset any gain.

If we do find headwind relief aloft, however, we have the airplane that can make the climb quickly. Even at 10,000 feet we can climb our airplane 500 fpm at 80 mph. It's the Skylane's pickup truck design that slows us down en route, but we can get some of that back when we descend.

## Chapter Fourteen

When we have done a good job of planning, our flights are pleasant and efficient and we are seldom surprised by the atmosphere or the behavior of the airplane. We motor along relaxed, confident, feeling just a bit professional about the way we have arrived over fixes and stayed on course. We have been helpful to ATC by anticipating their needs and by keeping our Skylane where ATC expects it to be. When we stray a few feet off altitude or wander from our heading, we get it right back and compulsively hold it there because we know that to be lax in any regime invites further carelessness. When a flight is working we feel like pilots, and we are.

There are times when I am alone in 3135Q that I am very relaxed. I am enjoying the flight so much that if I were to lose my medical the next day, I would be satisfied with that trip alone.

I can see myself sitting in a nursing home, wheeled into the sun of the afternoon by a bright young aide. "And what did you do during your life, Mr. Coffey?"

"Ah," I would say with a slow, broad grin, "I flew."

When I was a kid in the 1950s, I once flew back to boarding school in a DC-3. It was a late-night flight, a milk run that

stopped at nearly every airport with a beacon from Minnesota to West Virginia. There were only a few souls on board and the lights were turned down low. I was sitting at the window, over the wing, watching for the thunderstorms that we had been warned lurked along our route, when I saw a strange glow that seemed to rise and fall just above the propeller arc. I didn't know what St. Elmo's Fire was in those days, but I thought it beautiful and my fertile adolescent imagination conjured up images of the pilots as strong and powerful men who were working up a sweat as they controlled the fire-breathing engines, preparing to battle the thunderstorm ahead. I had befriended the stewardess who was sitting with me, and I told her my life would be complete if I could only stand for a few minutes behind the pilot and watch him work. She patted me on the head and went forward.

In those long-gone days in America there was a sense that all was possible. Kids had it, young people had it, and adults believed in themselves and they believed in the worth of their work. Ordinary heroes emerged from the day and smiled with confidence. I was proud of adults, then, and considered myself fortunate when I could have an audience with a man or a woman who worked at something with knowledge and skill.

The stewardess returned, smiling, and motioned for me to go forward. I climbed out of my seat on shaky legs and pressed forward through a narrow corridor filled with swaying racks of radio receivers and the smell of gas and oil and sweat. Just ahead I saw a small, red-lit cockpit with two men huddled over their controls. I appeared between the seats and the captain reached out and pulled me close. I felt as if I should kneel. He removed his headphones and adjusted them on my head. I heard a terrible crackling noise as if bacon were being fried somewhere in the cockpit. Behind all of the sizzling frying I heard what I assumed must have been the Morse code. The captain pointed to a dial with a needle that was spinning to the right and then to the left.

He pointed to my ears and then to the dial. The copilot looked up at me and laughed as I pretended to understand. I remember knowing just then that there could be no better life than years aboard an airplane, headset in place, making sense of the Morse code, laughing about a spinning needle, preparing to battle the clouds. But as I listened and scanned the rows of dials and switches, I became aware that the pilots were just sitting, hands folded in their laps. Every once in a while the copilot would reach up to the panel and turn a knob and the captain would tap a dial, but neither seemed interested in the lightening ahead or the engines that belched fire into the night. I was in awe of these men who had the power to control this machine with knowledge alone. I removed the headset and leaned over the pilot to point out the fire on port-side propellers. He looked and laughed. "St. Elmo's Fire!" he shouted. The captain pointed it out to his junior and they both watched for a moment.

I had no idea who St. Elmo was or why his fire should be so funny, but I was a part of the crew that night — me and the captain and the copilot — laughing about the fire and listening to the Morse code and sitting in our cabin watching the lightening ahead.

"We're going to get wet tonight, son," the captain said. "We'll turn to the left in a minute and fly through the clouds over there." He pointed to an empty space in the night. I remember looking into the black and nodding and thinking that if I should ever fly an airplane I'd want to remember what I learned this night.

The stewardess tapped me on the shoulder and I gave up my headset, shook hands firmly with my crew mates and went back to my seat. The stewardess saw that I got my seat belt on and then she walked down the aisle, waking passengers softly, helping them come from their sleep and into their belts. And she came to me again that night, before we were tumbled by the clouds, and she touched my head and smiled.

There are times when I can feel her hand on my head at night when I fly alone, and I think of her and her captain when I hear the Morse code of a distant NDB. Once, in the calm of a pre-frontal storm, I watched the St. Elmo's Fire come to 3135Q and felt as if I had been anointed.

So much of our flying life recommends calm, reasoned thinking. In an age when the terrorist's single pistol shot startles us to fear that reason is gone and wanton stupidity runs amok, we find in our cockpits time to become caring and precise and human. Here, away from the chaos of the day, we find the responsibility to enjoy freedom. Here, as we listen to the Morse frying in the bacon grease and watch the ancient needle sway in the electrical chaos, we can apply our knowledge and reason and come to the cloud in comfort.

The voices of the aviation industry are worried about the future of the small airplane, and they are worried that those of us who fly light airplanes have become disappointed. New airplanes are born, however; home-built airplanes are flying; ultralites soar in the skies once flown by Cubs and Cessna 140s. We are flying, still. And those of us who have put a Skylane in the air fly a museum of aviation artifacts that, when collected and preserved and organized in concert, produce flight as ably as any flying machine ever has and likely ever will. It is difficult and unreasonable for us to look back to the time when America was exploding with enthusiasm, when men and women of God believed in themselves and in the family and in the responsibility of freedom. The politicians and their bureaucrats have built a government that serves itself and cripples our spirit and will to excel. We feel impotent and afraid, and the only way that we can reclaim the values is to live well, to be proficient and able. When we fly our airplanes well, when we come to the sky responsibly, freedom awaits us.

Well, we have been out of the loop here for a few minutes, our

thoughts wandering, and we pick up our flight book and write down the time. Time has changed the weight and perhaps the balance of the Skylane as we burn off about 75 pounds of fuel an hour. We see that we were airborne at 2,300 pounds at 30 minutes past the hour. We have been aloft for one hour and a half. Because we have a fuel monitor on board, we have only to toggle the switch to see that we have 41.3 gallons remaining. If we don't have a fuel flow meter — and it's likely that we won't on most carburetor engines — we simply do the math: 1.5 hours times our fuel burn of 12.5 gph. We have burned 18.75 gallons of gas. This is interesting to us because we will be descending soon and our airplane will perform differently on arrival than it did when we departed. Our weight, and perhaps our balance, have changed. Having burned 18.75 gallons, our Skylane is 112.5 pounds lighter than it was when we took off. Fortunately, as the Skylane burns fuel, we lose the weight just above the center of gravity, which means that we are not likely to get ourselves into an aft-loaded condition, which is what can happen in, say, an older V-tail Bonanza. The Bonanza pilot may have established a balanced airplane on departure, but as fuel is burned from the wing tanks, the center of gravity moves toward the rear. As the weight of an airplane moves aft, the dynamic stability, which allows the nose to return to its original position, is disturbed and it becomes increasingly difficult for the airplane to maintain its trimmed airspeed. When an airplane is aft-loaded the stick forces become light, and when you flare for a landing, the nose may pitch up, the airplane may balloon and you may land hard or stall.

Our Skylanes are slow cruisers, but when we think about the balance problems that a less stable, but faster, airplane endures, the Skylane's utility shines. It is difficult to mismanage the Skylane's load. Imagine a Skylane with an hour of fuel on board (15 gallons = 90 pounds). Put a lightweight pilot (130 pounds) in the front and three big skydivers (200 pounds each) and their gear

in the back. Run that scenario on your weight and balance computer or use the chart in your POH. If you were to use an empty weight of 1,738, you would have a total weight of 2,558 pounds with a c.g. at 42.6, which is an aft center of gravity but well within the envelope. Now notice what happens when you add fuel. The weight increases but the c.g. doesn't change. Okay, let one of the skydivers get out so a 350-pound jumper can climb aboard. We are now 40 pounds overweight (using a 2,800-pound Skylane) and our c.g. has moved aft to 48.1 inches, which is on the edge of our envelope. The pilot unloads some fuel (7 gallons = 42 pounds) and then finds out that his partner wants to fly this run and she weighs 100 pounds. The airplane now weighs 2,768 and the c.g. has moved aft to 48.2. When the pilot taxis her Skylane, the tail is very low and the nose strut is distended. The pilot has to S-turn a bit as she taxis to see what's in front of her. When she takes off, the elevator will seem a bit light as she brings the control wheel back, but she may be surprised how heavy it will feel when she applies forward pressure to climb at a faster airspeed. In fact, she'll have to use a lot of forward trim to hold it at  $V_y$ , or best rate of climb.

As she climbs, the skydivers are moving around in the back and the pilot will notice how easily the Skylane is inclined to pitch up and how it is less inclined to return to the trimmed airspeed. She has turned the trim wheel forward seven turns from full nose up, and after 15 minutes she has reached 12,500 feet, pitched over and allowed the airplane to fly at a slow speed so she can open the 'jump door' and let the divers out. After the 15-minute climb she has burned five gallons of fuel, or 30 pounds, so we'll deduct that and find the new weight to be 2,738 and the c.g. at 48.2. The c.g. hasn't moved. Now the jumpers crawl into position and one by one they climb out, grab the strut and push off. In a few moments the airplane weighs 1,988 pounds and the c.g. moves forward to 36.2. As the c.g. moves forward 12 inch-

es, our Skylane pitches forward until the pilot holds back pressure and retrim the flight.

It is worth the time to experiment with loads and loading if only to experience the effect of weight shifts on the longitudinal stability of the airplane and on the performance and controllability of the airplane in flight. We would really like to know the feel of an aft-loaded Skylane on approach in the clouds or at night when we are already fighting enough illusions.

Do you remember when you were a kid at the playground on the teeter-totter with a fatty? Do you remember the terror you felt when he had you pitched way up in the sky and then, distracted by another kid, he prepared to jump off the board? Have someone ride with you and bring aboard a bunch of 50-pound bags — sand or potatoes, it doesn't make much difference. As you fly in a trimmed condition, have your helper move the bags from the front seat to the baggage compartment and back to the rear seats. Notice the trim changes that you feel on the control wheel. Now climb and clear a practice area. Set the airplane up at 15 inches and 2400 rpm, pitch up to the angle of attack that you might use to flare for a landing and hold it there. Have your helper move the bags around again. The Skylane is so stable that you won't have a control problem, but you will have to work.

One night I was on an approach to a small airport with an NDB. The ceilings were quite high (800 feet) and the visibility was pretty good in light rain (five miles). I was carrying passengers in the back seat, but I had dropped off a front-seater an hour before. As I came down through the clouds, I was having trouble maintaining the trim speed. I pitched up and down, and when I broke out and was on a short final, the airplane started pitching again. While I was rolling out, I noticed that my passengers had their baggage ready to offload. They had been unbuckled and were digging around the baggage compartment, moving things out and putting things back during the approach. I reminded

myself to tell passengers to stay in their seats, buckled, and be nice and quiet during an approach. In some airplanes I might have had a control problem.

As we near our destination we begin to build a picture of the terminal environment. We listen to ATIS and we listen to ATC talk to other arrivals and departures for clues that will help us understand traffic conditions, weather problems and the conflicts that we may experience as we start down through our arrival box to the airport.

If we are IFR, ATC may give us some clues with our clearances ("Expect the visual approach runway 22"), and we have set up the radios and nav equipment according to the plan we have created in our flight book. I open to the tab called 'terminal' and I see a page that says 'descent.'

The 'descent' page is my checklist to help me set up pitch and power when I start down, and I have a note to review the approach plate or terminal charts. My checklist has a guide to help me set up the two flip-flop radios so that all my frequencies are up, lighted and ready to use.

I usually do all my transmitting with my number-one radio and use the number-two box to monitor ATIS, Flight Service, the emergency frequency and terminal information sources, or I use it as a storehouse for frequencies that I'll need on approach, like the tower and ground control. This is an easy way to set radios up when we've got a stack of 'em to use and it avoids the hassle of switching our transmitter. If we have older radios we will set up the current frequency in number one and reserve number two for ATIS. I write all the frequencies down as I am given changes so I can go back to one if I tune something in incorrectly or if I can't raise anyone and I need to go back.

From my position just outside the Class B terminal area, ATC will ship me to Approach, Approach will hand me to another sec-

tor and a third controller may vector me to the localizer. At the marker I will need to know the tower frequency, and when I am off the runway I'll need to tune in ground control. If I miss the approach, the tower will send me to Departure and then Approach and we start all over again. It can get confusing in an unfamiliar terminal so we need to write the frequencies down.

I have my number-one radio tuned to the current ATC frequency (Center) and on the flip side I have the next ATC frequency, if I know it. Most of the time we can get the next likely frequency off of the en route chart or terminal chart. If Center gives us something else, fine; tune it in. When I flip-flop, I leave the old frequency alone until I've established contact and have gotten enough of a clearance to carry me along if I lose contact. If I can't raise the controller on an assigned frequency, I simply flip-flop back to the previous one and tell them what's up.

My number-two radio is tuned to ATIS and tower frequency. Since I rarely talk on this radio, it's become my advisory source. When I need to hear an ATIS update I tune the volume down and switch it on, leaving my fingers on the switch until I've heard the report, and then I switch it off. I may listen in on the tower for a few seconds to see what runway is actually being used.

I think I am getting too old to listen to more than one frequency at a time. It's a bad practice at any age because you are likely to miss a call. It's bad enough to have the NDB code ditting and dahing during the whole approach and doing the VOR identification checks without having the ATIS volume blaring and repeating the same information all the way down the pike. Get the ATIS numbers (wind, weather, runway and altimeter) and write them down. When I enter the terminal airspace I want a quiet headset tuned to my controller. The NDB volume is turned down in the background. If I want to check up on an ATIS change, I tell the controller I'd like to leave the frequency to get it. If he doesn't want me to leave, he'll give me the update.

We make life much easier for everyone when we listen to ATIS before our initial contact with Approach. If we can tell the controller that we have 'Information Charlie' when we check on, he'll think we know what we are doing.

I have tuned my principal fix on number-one nav. If I'm coming into the terminal using a VOR, then I fly that aid until I am firmly established on radar vectors, and even then I'll keep the primary terminal nav aids tuned in and use them to help me stay informed about my position on the chart. On the flip side I have tuned in the localizer frequency that I am likely to use. My number-two nav is loaded with one frequency, which is tuned to nearby nav aids as a cross-check. If it's available, I also tune in the nav aid that I will use if I miss the approach. My ADF is either tuned to the outer marker or NDB, or I use it to cross-check another approach. My Loran or GPS is tuned to the destination airport and, unless I'm flying a GPS approach, that's where it stays, always giving me distance and bearing information that is a big help in understanding my position relative to the airport in unfamiliar terminals.

My descent checklist also reminds me to get the DG and compass in agreement and get fuel switched to the full tank or to 'both' in our Skylanes.

The 'both' setting is reliable. If you have been switching tanks in an attempt to balance an uneven fuel load (and if your Skylane is pre-1979, you have experienced some unbalanced readings), it's conceivable that the near-empty tank will not siphon enough gas from the fullest tank during a long, banking turn. If we make it a habit to select 'both' once we descend into the terminal, we will always have gas for the approach — if we have gas on board.

As we near the terminal area we can expect that we will get a new altitude assignment shortly. We may get the clearance 'at pilot's discretion,' which is helpful if we are flying above an overcast where we suspect an icy bath or rough turbulence on a

hot summer's day. If we are cleared lower, without 'pilot's discretion,' and we believe that ice may be a factor in our new assignment, we have to tell ATC that we are unable because of ice. That's going to irritate the controller because it may ruin his planning, but if there is ice in the clouds surrounding a terminal, he's having a bad day anyway. We should try, within the capabilities of our airplanes and our experience, to comply with ATC, but when a question of safe airplane operation comes up, there's no discussion; it's our call and we need to make it very clear when we get the clearance that we will be unable to comply. If we let ourselves become intimidated and comply with a clearance that we don't understand or a clearance that we believe will be unsafe, we are going to become a problem for everyone. Anytime we feel pressured by the ATC system to do something that we are not comfortable doing, it's our responsibility to let them know we have a problem with the clearance. On the other hand, we need to be proficient if we are going to fly in the system, and if we aren't comfortable in there, we stay out and get some review and some instruction in the terminal before we barge in.

If we are VFR and heading for Class B or C airspace, we are welcome if we are equipped with good communications, a transponder and Mode-C encoder. We need to sit up and fly right, repeat clearances and understand the rules of the game. It helps a lot to get some dual with an instructor and review the regulations if we haven't used 'the system' for a time. The protocol varies from terminal to terminal and protocol changes over time. If we get nervous and our flight is causing problems for ATC, we need to settle down and be clear about the instructions. Flying in the terminal area is no different than flying anywhere else in our 'box,' but things will happen faster and things may happen that we didn't expect. In some areas, like the Northeast corridors, we never know what to expect. But knowing that the frequencies will be chaotic and that we have to listen up helps us.

When we are VFR we need to know where we are, visually, at all times. When we start getting vectors to one place and another we have to keep up, visually, and be prepared to navigate on our own at any time. When we are IFR, situational awareness is a way of life. We make turns and descents, navigate to intercept radials and fly headings. We need to check our DG against the compass when we are straight and level and keep the airplane in trim while flying the numbers so the airplane is doing all the work. If we are managers of our flights en route, we are managers in conference with ATC during our descent into the terminal.

When I am coming into terminal airspace and have read back my clearance to descend with a turn or descend with a vector to a nav aid, my flight book is in my lap where I can write down headings and altitudes as I am receiving vectors. I descend by pitching over to one bar below the horizon when I leave my cruise altitude, I trim one turn nose down and I enrich the mixture to 1425°F on the EGT. As I descend I start the throttle back to 20 inches, a couple of inches every two minutes, and then, as I continue down, I maintain 20 inches until I am level. When I reach my assigned altitude, I pitch up, put the bar on the horizon and trim one turn nose up. The airspeed will bleed off as I am herded toward the airport localizer or nav aid for the approach. I will maintain 20 inches of manifold pressure and 2200 rpm, mixture adjusted for 1450°F, and I will clip along at 120 mph. When I am vectored for the approach, I will hold the nose on the horizon, bring the throttle back to 15 inches, trim one turn nose up and motor along at 100 mph.

While I am downwind of the localizer, I will turn the page in my flight book to review the plate one last time for the inbound heading, the decision height or minimum approach altitude, and the miss. I will check that fuel is on 'both' tanks, that mixture is

enriched to 1425°F, and look to see where ATC is taking me on the approach plate. When I have an idea how we are going to intercept, I scan the approach again and I plan on flying the missed approach. My flight book is on my lap and I am ready to receive my approach clearance.

The approach clearance is our stage call. This is our moment in the lights, the moment we prepared for when we studied the weather, the terminal and the procedure before we left the ground two hours ago. We are coming down through our box to the destination, relaxed like the cat at the mousehole. When the clearance comes, it may come fast, but we listen for the heading, altitude and instructions that will follow. The airplane is trimmed and flying without us having to exert pressures, the power that we have set will get us to the final approach fix, and we are relaxed and scanning with maximum position awareness. When we read the clearance back, all we need to say is: "3135Q, two-seven-zero degrees, three-thousand two hundred until established, tower at (the final approach fix) and cleared for the approach."

I loosen up, relax, pump up my scan to gigabyte level and fly the airplane. This is an IFR pilot's command performance. When we get the clearance for the approach, we push the curtains aside and step out to the center of the stage. This is where we earn the right to wear the little wings on our tie.

## Chapter Fifteen

Several hours ago we were contemplating a 223-mile cross-country to Sioux Falls, South Dakota. We imagined a box of air-space through which we would pass in two hour's time. We considered obstructions in the box, which included solid things like tall towers, mountains and other airplanes, and we considered obstructions that had energy, like thunderstorms, thermal convection and ice. We took time to plan and we used our flight book to guide us away from our earthly preoccupations to a conscious state of preparation. When we were finished planning, we felt as if we had actually made the flight. Like the military pilot who 'flies' the mission in the ready room before he lights the fire of an F-16, we are prepared to fly when we feel our own readiness and know our airplane's status, its weight and its capabilities to depart and perform in a specific atmosphere. If we were hurried and left something out of the planning process, we have probably paid for that by experiencing lapses in our attention when we prepared to take off or when we checked on with Departure. We felt overloaded at times and momentarily confused. When we have not done a good job of preparation, we will encounter weather that we didn't expect or we will burn more fuel than we thought simply because we didn't think through our objectives and fine-

tune our power settings with the flight conditions.

As we all know, the real pleasure of flying our Skylanes comes when we use their great utility to the best advantage. Left to its own devices, our Skylane will muddle along just fine, burning gas and making noise. Our airplane is not clean like a Bonanza, and we are protected by its simplicity and by its high drag profile. We have to work at losing control of a Skylane. Our airplane is so strong and stable that we can survive bouts of moderate and severe turbulence even at speeds a bit higher than our maneuvering speed adjusted for weight; we can fly big bumps IFR without losing control. And the Skylane is powerful. We can load our airplane with four big people and just about anything that they want to bring along, fill the tanks with gas and depart a high-altitude airport with a pretty good chance of survival.

But when we talk about the pleasures of proficiency, we are not talking about ham-handing an airplane. Our Skylanes are capable of far more performance than we ask of them. Proficiency means that we are flying with an edge; we are striving to get the most of our airplane's unique design. We do this because we have pride in our work, and we do it because there is more pleasure in flying well than there is in bumbling along burning gas and making noise. Proficiency is the stuff of test pilots, and it can be our stuff too, if we take the time to learn about our machine and its environment and then fly in an organized way.

The Skylane is considered simple to fly and one of the 'safest' airplanes in the general aviation fleet. When Skylane pilots come to grief, however, they do it the way pilots of most airplanes do it a few moments before they die. They lose control. Pilots lose control of the airplane when they lose control of their plan and when they lose control of themselves. Some pilots die when they are sick or incapacitated; some lose control when they become passengers as the airplane veers off the runway. Pilots lose control when they can't see outside and are not proficient to fly an

artificial horizon. Pilots crash Skylanes when they lose control of their knowledge and let intuition take over. The pilot who thunders around the family farm, close to the ground, dies when he banks too steeply and falls out of the turn and tries to recover intuitively by pulling the nose up. The pilot who flies at night, VFR into conditions of haze and smoke or rain and fog, dies when he becomes lost and unorganized and is either too timid to take any action or becomes belligerent and begins to take actions for which the airplane wasn't designed. We don't know, of course, but we all think pilots may die when they give up. When the environment is unfriendly and the atmosphere is disturbing, a pilot becomes worried. If he just sits there, hoping something better will happen, and it doesn't, he may begin to panic. When a pilot panics, he may simply shut down and do nothing, or he may move the controls wildly, stabbing at the rudder, hauling the control wheel back or pushing the nose down to plant the airplane on the runway.

Very few accidents just happen. Accidents are usually the result of a sequence of bad decisions.

Pilots who 'gotta get home' no matter what the weather make their first bad decision before they even start the engine. Pilots who are prepared and who have flown a proficient flight en route, but who lose the runway on an instrument circle to land, may make only one bad decision that day and die.

Our Skylanes are so stable, so comfortable and today, so well-equipped that we can be in deep trouble before we get cues that anything is wrong. I think of a short night flight that I made to my home airport. It was a beautiful VFR night. The air was smooth; the cockpit lighting was bright. My David Clarks masked most of the engine noise and I was listening to Center and some pilot discuss the merits of the Lancair. It was a lazy, easy night. I felt secure and protected by the large Skylane cockpit. My Loran and the VOR needles told me that it was time to

descend to my home port. I throttled back five inches and started a cruise descent, 500 fpm. I switched frequencies and announced my arrival on 122.9. I banked the airplane and saw the beacon of my northwoods airport. The Skylane was doing all the work. I lifted the nose to the horizon, throttled back to 15 inches and motored on down to the pattern. On downwind the airport beacon flashed inside the cockpit. I turned base. I was relaxed. Not like a cat, but relaxed like a dishrag. Somewhere during the night I had become a passenger. When I turned final I stayed high over the dense forest, and then I throttled back to 1500 rpm and started down final, 10° flaps, 20° and 40°. My approach speed was 65 mph.

Then the runway lights went out.

The lights are not pilot-controlled; there is no tower; my airport is just a municipal strip of asphalt surrounded by trees. I was hanging there over a black hole at 60 mph, full flaps, descending, landing lights revealing only the ominous emptiness. I was dumbstruck. I remember having only one clear thought: Why did the runway lights go out? In a second I saw the runway numbers flash by and I woke up and flared. The landing was fine. The procedure sucked. Why didn't I apply power and pitch to the airspeed that I know will start a climb the moment the lights went out? Because, instead, I was dumbstruck. Because I sat there like a passenger and watched it happen. As I taxied in, the lights came back on. The town had had a power failure for a few minutes, and I had stopped flying for just a few seconds.

And what difference would planning have made that night? In my flight book, I have a page that tells me what speed to climb my Skylane with full flaps in the event that I reject a landing. When I brief and prepare for a flight, I look at those numbers because they are based on the weight of the airplane. I didn't look at those numbers that night because I was going home to an airport that is as familiar to me, day or night, as my own bed. It was

a routine flight, but, as we all discover eventually, it turned out not to be a routine night. Eventually, we come to learn that no flight is routine. And I learned that night that when we plan, we plan the whole nine yards or nine phases of flight within our box, and we do it every time. We review the numbers and we fly by them as if our life depends on it, because it does.

When we have come to the end of our flight and begin an orderly descent, we are relaxed and prepared for an approach that will lead to a smooth landing. Our airplane is stable and moving through the airspace at two miles a minute. We are monitoring the pitch setting and the power required to maintain our altitude. We may be in conference with ATC, working together to move our radar return across a screen in concert with other traffic. We are quick to respond to ATC's calls. "3135Q turn left two-two-zero degrees, descend and maintain three-thousand. Contact Approach 125.0."

"3135Q, two-two-zero, four thousand for three thousand. 125.0."

We can also say, "3135Q, two-two-zero, four for three, 125.0." What's important, of course, is that we get the message across and that the controller is confident that we understand what to do.

Sometimes the radar environment protocol and objectives aren't much different than a busy fast food joint with people moving up in line, studying the menu and arriving at the counter without a clear idea of what they want. The 'rules' say that you don't have to wait for the clerk to ask you what you want. You just start talking: "Ahh, two hamburgers with pickles and, ahh, I think onions — no, just pickles. Oh, and french fries, and an order of, ahh, do you have, ahh, onion rings?"

"Yeah. You want onion rings?"

“Okay.”

The clerk reads it back.

You say, “Okay, and can you put mustard on one of the hamburgers? And I guess a couple of Cokes.”

“Small, medium or large? Diet or regular?”

“Ahh, medium and, ahh, regular — no, diet — no, one diet and one regular.”

If we knew what we wanted before we got to the cash register, we’d just spit it out, the clerk would read it back and we’d pay and stand aside. But when we don’t do that, it’s because we don’t know what we want. When we are entering Center’s airspace or Approach’s terminal area or the tower’s airport traffic area, we will cause trouble if we don’t know what we want or if we are indecisive.

When we have a plan we simply follow it. If our plan does not fit the flow, ATC will give us another plan. We quickly decide whether we can safely comply with ATC. If what ATC proposes compromises our safety or our abilities, we let them know right away by using the word ‘unable’ and whatever the clearance was. Now we are a problem. We are moving around in their space without a plan. So before ATC asks, know what your intentions are: another airport, a different altitude, a vector out of the airspace to a hold or cancel IFR, if you can, and proceed VFR. When we planned our flight earlier that day, we thought about possible conflicts and what we would do if we couldn’t get into the airport.

Meanwhile, the Skylane is running at 20 inches and 2200 rpm, 120 mph. We are trimmed and checking to see that passengers have put their belts on, if they took them off, and have stowed the pointy things and the heavy stuff that might hurt them in turbulence. I was flying some kids once, and as we descended into turbulent air I looked back to see two ten-year-olds playing with a

survival knife that I *used* to keep under the seat.

This is a good time to use the services of a right-seater. Just tell them to see if everyone's ready to land. You'll close your eyes and shake your head when you hear, "The pilot says we are going down — get ready!"

And 'going down' is easy on the O-470 if we keep the temperatures up. We want to be sure that the cowl flaps are closed and that we are making power reductions slowly, evenly, a couple of inches every few minutes, no more. If ATC doesn't like 120 mph in their space and asks for more and you have the time and the control to speed up just then, add four inches and one turn of trim, nose down. Now you are going 130 mph. If ATC's idea is to turn you onto the approach course, hellbent for leather, it's because he's trying to fit you into his plan, which includes at least two airplanes with very different approach speeds. If a fast approach isn't comfortable, let ATC know right away and he'll vector you out for another try somewhere behind the fast airplane. Remember that the controller wants to make things work for all comers, Skylanes, Barons, MD-80s and B-767s. But she needs to know what your limitations are long before they hinder your ability to comply.

If we are on an ILS approach in IMC, we are flying vectors to a localizer. If we have broken out of the clouds we may be flying a visual approach to some runway, and we'll be expected to confirm traffic call outs. We can do this because we have trimmed the airplane for an approach speed, we have the runway in sight and we are relaxed.

If we are VFR, we fly the Skylane with the same precision that we would fly IFR. We descend from our cruise altitude at a relaxing rate so that we arrive at pattern altitude at least three miles from the airport. It's an easy thing to figure. If we are flying at 5,000 feet on the altimeter and planning to descend to a

pattern altitude of 1,800 feet MSL, we need to lose 3,200 feet (5,000 - 1,800 = 3,200 feet). If we plan on a gentle descent of 500 fpm, it will take us six and a half minutes to descend (3,200 feet divided by 500 fpm = 6.4 minutes). Our groundspeed in descent depends on whether we push the nose over one bar to descend at 500 fpm at 140 mph or if we maintain the cruise trim speed and reduce the power by five inches, which will give us a 500-fpm descent at cruise speed. Since we will be descending and we know that upper winds tend to move to the right of their direction aloft, we can get a good idea of our groundspeed. If we had a tailwind during our flight at cruise altitude, then we will tend to descend into winds from the right at reduced velocities. If we had headwinds en route and descend, the winds will push us from the left as we get closer and closer to the ground. Either way, or all 360 ways, actually, we can estimate our average groundspeed during our descent, say 120 mph, and do some quick math. How far will we travel over the ground at 120 mph in 6.4 minutes? We are traveling two miles a minute times 6.4 minutes, or about 13 miles. So if we are hanging out at 5,000 feet and want to arrive at 1,800 MSL three miles from the airport, we'll need to start down at 16 miles out.

If you haven't done this simple math routinely, it can seem a bit more complicated than it really is. Next time up, get a record keeper and a traffic watcher, climb to some random altitude, pick a distant airport and plan an arrival. It really makes you feel good to plan a descent and it'll really make your Skylane happy too. Our engines are very happy to produce a lot of power and make a lot of heat, but they want to be cooled slowly, which means arriving over the airport at 5,000 and diving for the runway is a bad deal. These power-off dives are not only guaranteed to crack some engine parts sooner than later, but you'll become a hazard to any airport traffic. If you think somehow that you will save time by slam-dunking your airplane, go out where there is a lot

of space, clear the area, keep your engine warm (15 inches) and try pushing over in a steep descent to some predetermined altitude. Don't take anyone with you whom you want to impress, because you won't.

VFR or IFR we are likely to descend out of smooth air into bumpy air, especially if the surface winds are high (20-30 kts) or if it's just about anywhere in the United States on a hot summer afternoon. A high-speed descent from smooth air into turbulence is one of the really stupid things that we do to passengers and airframes and it's unnecessary. If we maintain a 500-fpm descent at cruise speed, say 150 mph, we'll be about 20 mph above maneuvering speed. If the surface winds are high or we know the thermals are cooking (by noticing all the cumulus at 4,000 feet), then we simply throttle back from 20 inches to 15 inches, slowly (two inches every two minutes), and pitch the nose up to put the bar on the horizon. Now we are descending at 120 mph and we can look at our flight book and see what the correct maneuvering speed is for our weight. We set the speed with the control wheel, trim it and use the throttle to control our descent into the pattern. It only takes a few inches to make a very big difference in descent rate (about 100 feet per inch of manifold pressure) so we go easy; we are trying for maximum smoothness here. If you want to impress groundhuggers with your flying skills, try making control movements and power changes so smoothly that they don't know you're doing anything. They'll love you and they'll tell everyone that flying with you was smoother than the airlines.

And when you are smooth, you are cool. When you hit the summertime convective thermals at 4,000 feet, going slow, at Va, your airplane will last longer, your baggage will stay in the back, your spouse won't want to trade the airplane for a boat and you'll be calm, looking for traffic, talking cool on the radio and making a plan to enter the traffic pattern.

At 15 inches and 2200 rpm we will be clipping along at 120 mph, straight and level, and we'll have time to fit in with slower VFR traffic and yet be fast enough to find our way into the pattern. Since we have been making gradual power reductions since we left 5,000 feet, our engine temperatures will be stable. As we enter the pattern downwind, we can reduce the throttle very slowly to 1500 rpm. Check cowl flaps closed, make radio calls, check fuel selector on 'both,' mixture rich, bar on the horizon, maintain pattern altitude. We turn the trim tab nose up three turns, watch for traffic and fly level at about 80 mph. We give the runway the once-over as we fly parallel, checking out its condition. We look at our flight book one last time to check that we have prepared the airplane for a landing. We check that our passengers are still with us in spirit, let them know that we'll be landing in a moment and ask them to please keep the seat belts on until the airplane is stopped. Another radio call downwind, and then we relax because this will be the nicest landing we have ever made.

Meanwhile, IFR, back on the localizer, ATC has cleared us for the approach. We have set the power at 15 inches and 2200 rpm. We have confirmed again our inbound course, we know the DH/MDA and we begin to see the localizer needle move. Now we sit back and micromanage. The needle drifts closer to the doughnut and we stop it with a rudder pedal and hold it there. Check the heading. We are level and trimmed for 100 mph. At the final approach fix we'll intercept the glideslope, push the nose over one bar, spin one turn of trim nose down, start our time, call the tower and fly the inbound course on a heading that holds the localizer dead center. With these power settings we will scoot down the localizer. If we have the time, and we usually have it if we want it, the alternative to pitching over one bar under the horizon is to reduce the throttle to 1500 rpm and make no trim change. That will be our last power setting until we are ready to

land, so there's nothing to do but stay on the localizer and the glideslope until we reach DH or MDA (if it's a localizer approach). Then, unless we have the runway environment in sight and we are in a position to make a landing we advance the throttle gently, pitch up to our best rate climb speed of 79 mph (assuming a weight of 2,300 pounds) and trim two turns nose up. Now we can sit back and call the miss, tell ATC what we plan to do and do it.

When we are VFR downwind, just opposite the point of touchdown and level at 1500 rpm and 80 mph, we push the flap switch to 10°. On Skylanes before 1973 we have no preselect switch, so we'll have to stop the flaps by switching off or, prior to 1969, by releasing the pressure on the switch. In models produced in 1956-1961, we set the flaps with a handle. If we are landing at an uncontrolled field, we let the Skylane stay downwind about 30 seconds past the point of touchdown, unless we are being pushed by a blistering wind — then 20 seconds will do just fine. As we drift along, we check the runway again to see that we have remained parallel and then, looking carefully to our right and left, above and below, we turn on the base leg, pitching up against the control pressure as we turn. When we roll out and announce our position, we are trimming to full nose up, all the way to the stop.

We watch the runway. If it appears to be rising in the side window we know that we will be too low, so we relax our forward pressure on the control wheel. If the runway seems to be falling in our side window, we reduce the power a few rpm and hold against the back pressure. Twenty degrees of flaps. Push forward gently as the flaps are coming down. The drag will take the pressure away in a moment. Airspeed is about 75 mph as we turn final. Check out the runway. If it's rising in the windshield, press forward on the control wheel and add a few — very few — rpm

until the runway stops rising, then relax the pressure. Call final and drop 40° of flap. All of it.

Time out.

Some pilots have had a bad experience with full flaps (40°) in older Skylanes, and our barn-door flaps have gotten some bad press and an undeserved reputation to be dangerous. If we learn to pitch the nose down as the flaps are coming down and maintain 60-65 mph on final, we are in safe configuration. The complaint, I believe, points to what happens next. With an airspeed of 60-65 mph and the steep nose down pitch angle, how do we safely rotate in the flare without dropping the Skylane to the pavement? Let's try it.

As we fly down final with full flaps (40°) and full nose up trim maintaining 1500 rpm, we will feel a small amount of pressure on the control wheel. If we relax the pressure, the nose will rise just a bit and the descent rate will increase. Hold the airplane steady and allow it to descend. We look out the front window, way down to the end of the runway where the perspective is normal, and just as we feel a small acceleration (which is the airplane accelerating in the ground effect) we pitch up until we can't see the end of the runway and hold it there. We ought to have the control wheel pulled nearly full aft. As we pull the nose full aft, we will need to add right rudder. We'll have to add a lot of right rudder if we jerk the nose up, so pitch back slowly. The wheels will chirp; we'll keep our eyes straight ahead and maintain full aft control wheel. When the nosewheel touches the runway we keep our eyes outside, ahead. We never, never look inside the airplane for anything. If a passenger is screaming bloody murder, we keep our eyes front, full back pressure. We'll stay off the brakes but have our toes positioned to apply even pressure when we have slowed to a walk. Then we let the control wheel go forward, gently, raise the flaps and get off the runway.

In a crosswind, we do nothing differently except hold the run-

way centerline by crabbing (tracking down the runway centerline) and, holding the control just where it is, pushing a rudder pedal to align the airplane with the runway a few feet above the surface. When we are going fast we will need a slight deflection of the controls into the wind with increasing deflection as we slow down to taxi speed. We can use the Skylane's full flaps in a mighty wind, but we'll get knocked around quite a bit and it may be more comfortable to fly with 20°.

There are no good aerodynamic reasons to fly a faster approach when there is a crosswind, and there is one very good reason not to. We don't want the Skylane wing to be moving along at flying speed (generating lift) when we touch down. This is true on a calm day, and on a windy day we will find it impossible to effect positive nosewheel steering while the wing is producing lift. It is likely that our Skylane will rise up on the nosewheel if we relax the back pressure when we try to 'pin it on' the runway, and we'll bend the airplane.

If we think we may encounter true low-level wind shear, we can maintain 75 mph on approach and add power when we need it. It doesn't take much (100 rpm is a lot of help) to get the Skylane wing flying again. When we are over the numbers, under control, the airspeed bleeding off, we touch down at 55-60 mph.

We may have to use more power during a windy approach, but our airspeed should never be allowed to increase above 70 mph when we are over the numbers with 10° of flaps or more.

The Skylane is so stable that a strong crosswind (the factory says the Skylane is approved for a 15-knot crosswind) will tend to drift you slowly, and you may find the ailerons a bit unresponsive as you try to turn back to the centerline. The solution is to use enough aileron to stop the drift. If we feel there is not enough aileron and rudder to stop the drift, we level the wings, apply full power smoothly and climb out at our go-around airspeed, retracting the flaps slowly as we go.

Once the airplane is on the ground with a strong wind blowing, get the upwind aileron down and keep that big elevator down when the wind is on your hindquarter. The Skylane control surfaces are real sails, and because the airplane is so big we may not feel the early stages of an upset.

When we have taxied in, shut down, and the passengers are safely off the ramp, we can go back to the Skylane and write down the hours on the tachometer, order fuel and fill out a fresh status page in our flight book.

Then, if you're at all like me, you'll probably walk around to the front of the airplane and give the old girl a pat on the prop. There is no more to be done; she has finished her job, and you have finished yours.

# Epilogue

At night, alone above the clouds with only the moon for company, the distant earth seems an alien place. I have often flown by the stars and found myself enraptured by the illusion that I was not moving at all. I know the relief of seeing a single light pass beneath a hole in the cloud after hours of motoring through the darkness in silence. The noise of the engine and the rolling seas of night winds give life to the flight and push away the loneliness that sweeps over a pilot like the chill of an open window. Within the cockpit, the scattered red light illuminates dials and gauges, which, like the monitors attached to a sleeping form beneath the blanket on a hospital bed, are the only visible signs that there is still life. The tired pilot fights hard to maintain an understanding of these instruments and must often force meaning from the attitude gyro and the altimeter, the airspeed and direction indicator. Engine instruments verify engine noise, fuel gauges warn us to look at our watch, and night flying reminds us that we fly alone.

Night flying sharpens our sense of commitment to this small, winged machine, and the loneliness reminds us that we have chosen to fly because the experience of it gives us a powerful sense of confidence in ourselves. In an age when so many people have

allowed themselves to be woven into a social fabric created by government in the guise of 'fairness' and 'safety' and 'equality,' the pilot enjoys the freedom of responsibility. The happiness, the contentment, and the pleasure of living come when we have done good and important work. It makes us feel powerful and important to have accomplished something that required difficult thought and exceptional skill. There is no safety net to catch the pilot who has failed to make the right decision; there is no time between the moment of neglect and the crash to appeal. Even the long arm of the FAA cannot reach into the cockpit of a small airplane aloft, above the clouds at night, and make safe and fair and equitable a flight mismanaged by its pilot. Taking an airplane into the air presumes a level of skill and responsibility that exists in no other human adventure. Learning to fly an airplane is a lifetime pursuit of perfection, and we are rewarded as we become the pilot that we were not the day before. We give of ourselves greatly to understand the airplane, and we give again to understand how the airplane is to be used. When, one day, we truly know the machine and its wing, and when we know the air through which the wing travels above the clouds before it descends to the runway of a distant place, we have joined the ranks of the few who know the pleasure and the power of proficiency.

## NOTES

The flight book includes all of the information a pilot needs to plan a trip, collect the relevant meteorology, employ the aircraft performance numbers and fly the Skylane. The first page of the flight book, filled out after the last flight, reveals the airplane's current status. After being away from the airplane for several days the pilot can see at a glance that there is 31.5 gallons of useable fuel on board (for flight planning purposes), 219 pounds of fuel (fuel weight, including unuseable fuel) and 45 pounds of semipermanent baggage, all of which permits 797.9 pounds of payload for the next flight.

N3135Q  
Skylane 182K  
Serial # 18258135

Date: 11-8-96

Tach: 4544.08

Useable Fuel:

31.5

Empty weight: 1738.1

Useful Load: 1061.9

+ Baggage: 45

+ Fuel on Board: 219

= Current Weight: 2002.1

Available Payload: 797.9

Maintenance:

- Oil Change @  
4560.

- ✓ Rosewheel  
Tire pressure

N3135Q's airplane status page.

## NOTES

When we want to calculate airspeeds that are adjusted for the airplane's weight, we use this formula:

$$V_1 = V_2 \sqrt{W_1 / W_2}$$

Where:

$V_1$  represents the airspeed we wish to know,

$V_2$  represents the published airspeed for a given weight,

$W_1$  represents the weight for which we wish to know a certain airspeed, and

$W_2$  represents the gross weight for which airspeeds are given in the operating handbook.

The formula works like this: We know by looking at the pilot's operating handbook that Cessna recommends a calibrated airspeed of 128 mph for maneuvering speed. This is the speed that we might use to penetrate turbulent air when our airplane is flown at gross weight. But say we have been flying for a few hours and during a letdown into a layer of cumulus we expect a rough ride. We want to slow down because we know that a vertical gust produces more of a g load on a lightly loaded Skylane than one flown at gross weight.

We also know that if we have been flying for, say, two hours and have burned 26 gallons of gas, or 156 pounds, that number must be subtracted from our departure weight of 2,700 pounds.

We work the problem like this:

Compute the current weight ( $2,700 - 156 = 2,544$ ). That is, departure weight (2,700) minus the fuel burn (156) equals a current weight of 2,544 pounds.

Divide 2,544 pounds by the gross weight (2,800) and determine its square root (.953). Multiply .953 by the gross weight

maneuvering speed (128 mph) and we get 122 mph, which is the maneuvering speed for a Skylane that weighs 2,544 pounds.

Since it's just a bit inconvenient to run the formula while you are flying, you may wish to build several tables of airspeeds representing weights from gross to a lightly loaded airplane. In my flight book I use a selection of airspeeds from gross weight (2,800) through 2,000 pounds. I use the same formula to determine takeoff airspeeds, best L/D speeds (best glide) and stall speeds. My chart for over-the-numbers landing speeds with full flaps looks like this:

<u>Weight</u>	<u>A/S mph</u>
2800 .....	69
2700 .....	67
2600 .....	66
2500 .....	65
2400 .....	64
2300 .....	63
2200 .....	61

I tuck these weight/airspeed tables into the 'departure,' 'en route' and 'arrival' checklists. When I am ready to depart and I have finished my pre-takeoff checklist, I note the current weight of my Skylane, check out the required airspeed and then, with the book on the floor, fly the airplane.

One side benefit of setting up numbers for your airplane is that you will be alerted to engine troubles when your airplane gradually fails to meet the performance specs that you have created. A stable level of performance by the numbers is a good indicator of your engine's health.

Richard Coffey has written for regional and national aviation publications since 1976. He is a flight instructor, a Commercial pilot with multi-engine, instrument and seaplane ratings, and flies a 1967 Skylane.

When, one day, we truly know the machine and its wing, and when we know the air through which the wing travels above the clouds before it descends to the runway of a distant place, we have joined the ranks of the few who know the pleasure and the power of proficiency.

— Richard A. Coffey, *The Skylane Pilot's Companion*



Cover acrylic by Cliff Letty

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