ANATOMY OF A SUCCESS

The makings of a winner

BY THOMAS A. HORNE

Deep within the breast of every pilot beats the conviction that flying is glamorous and inspirational—a high-tech indulgence capable of making us transcend the ordinary. So what accounts for the immense popularity of the Cessna 172/Skyhawk series of airplanes?

After all, the Skyhawk comes off as the most prosaic of light aircraft. It's plain Jane at its very plainest. The essence of ordinary. But take a look at the numbers—more than 36,000 sold, over an extraordinarily long, 31-year production run—and the Skyhawk comes out way ahead of all its competitors. In fact, the 172/Skyhawk is the world's most popular single-engine airplane.

It's been the step-up airplane for generations of pilots who have bided their time in two-place trainers. The airplane of choice for the family man—or woman—as an inexpensive cross-country machine capable of cruising at about 115 knots and carrying four people 600 nautical miles.

It's also shown great versatility. Skyhawks have served in roles ranging from bushplane to military service, wearing everything from skis to floats to munitions hardpoints. Pound for pound, dollar for dollar, the Cessna 172 series has perhaps the greatest utility of any single-engine airplane.

A 1959 Cessna 172 (top), the last year for the straight tail. A hangarful of 1959 C–172s, factory-fresh and ready for delivery to that year's 788 customers.

Clearly, Cessna must have done something right.

That something began in 1954, with Cessna realizing that its mainstay four-place single, the 170, was beginning to lose market share to the Piper Tri-Pacer. Suddenly, the Tri-Pacer began to look like the wave of the future. The C–170 had been in production since 1948 and had conventional (taildragger) landing gear. The Tri-Pacer, introduced in 1951, had a pilot-friendly, tricycle-gear arrangement.

Cessna engineers were doctrinaire in those days and at first scoffed at the Tri-Pacer's landing gear design. Conventional landing gear could handle soft or rough fields better than tricycle

PHOTOGRAPHS COURTESY OF CESSNA AIRCRAFT COMPANY

designs, they said. The gear created less drag and cruised faster, to boot.

The gospel at Cessna was that the 170 would stay. The plan was to bring out a new Model 170 (the 170C) for 1956, one with a larger horizontal stabilizer and more up-elevator authority. It seems that the 170 needed more elevator power in order to make three-point, full-flap landings easier to perform at forward-CG loadings. The C–170C was also to have a new engine—a derated, six-cylinder, 145-horsepower Continental O-300-A of the type used in the 170B. In the 170B, this engine was rated at 155 hp.

But change was in the air. On their own, some Cessna engineers came up with a nosewheel installation for the C–170 and even went so far as to make a mock-up. But a manager's weekend stroll through the shop put a swift, if temporary, end to the nosewheel experimentation. A Monday-morning memo from the vice president of engineering ordered that the mock-up be destroyed. It wasn't. Instead, the conspirators hid it.

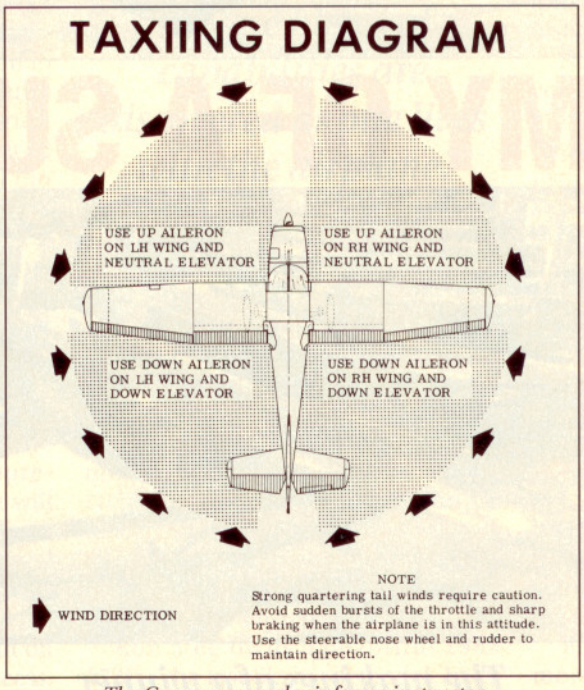
By spring of 1955, the Tri-Pacer once again became the subject of debate. Its brisk sales persisted. At one point, Cessna even rented a Tri-Pacer to evaluate the airplane firsthand. Finally, with some regret, Cessna management gave a secret authorization to develop a tricycle-gear version of the C–170C. Out came the hidden, once-forbidden mock-up.

Two months later, on June 12, 1955, the first trigear 170C had its maiden flight out of an abandoned sod strip in Kingman, Kansas—50 miles away from Wichita and prying eyes.

You might think that something as simple as installing a nosewheel would pose no great challenge. That's what Cessna's engineers thought, too. But surprisingly, this was not the case. First, the airplane's center of gravity had to be lowered so that strong or gusty surface winds would not throw the airplane up on its nose and wing. Adding a nosewheel to the C–170's main gear resulted in an empennage that stood tall—tall enough for gusty air to lift the airplane's tail. Solution: Shorten the main gear and lower the entire airplane.

Other associated problems quickly became evident. A lowered airframe meant less propeller clearance, so an air/oil oleo strut was developed to dampen the airplane's bobbing motions as it taxied over rough surfaces. And what if the nosewheel bogged down during taxi? The engine's high thrust line would help dig the nosewheel in even deeper if a pilot tried to power himself out of trouble. Solution: Enlarge the horizontal stabilizer and elevator so that up-elevator forces would be enough to help lift the nose.

Finally, what about the nosewheel's steering linkage? Then-chief of Cessna flight testing and aerodynamics, William D. Thompson, took a dim view of the Tri-Pacer's arrangement. In the Tri-Pacer, the nosewheel is tied directly and continuously to the rudder control system. Whether on the ground or in flight, a push on a Tri-Pacer's rudder pedal brought both a rudder and a nosewheel deflection. In flight, this meant degraded directional stability due to the drag of the deflected nosewheel.



The Cessna manual reinforces instructor admonitions to quickly learn correct control-surface positions for taxi.

According to Thompson, project engineer Obed Wells found a solution based in part on the self-centering mechanism used on the Cessna 310's nosewheel, which at the time was one of Cessna's only two tricycle-gear designs (the T–37 military jet trainer was the other). Wells devised a centering cam that rode against the strut's collar, which was located above the torque scissors assembly. On the ground, rudder pressure would activate both the rudder and the nosewheel steering. But once airborne, the strut extended, the collar dropped down to meet the cam, the nosewheel steering disengaged, and the nosewheel automatically centered. Meanwhile, the rudder remained engaged. It was a brilliant solution; steering authority on the ground was not compromised, and directional stability in the air was enhanced.

By the end of 1955, the landing gear had been thoroughly tested. Cessna insisted on using pilots with no previous experience flying tricycle-gear airplanes and told them to experiment at will. The orders were to try as many takeoff and landing techniques as possible and not to pamper the airplane in the process. With a few exceptions (nosewheel vibration, strut noise, and tire wear after hard braking), the airplane came through with flying colors. The only major problem had to do with the tall tail and occurred when taxiing downwind, then using hard differential braking to turn sharply. Many times, pilots of early 172s would taxi to the run-up pad, pivot into the wind by locking the brake on one wheel, and be promptly blown over. In spite of the chopped main gear and the lowered airframe, many airplanes were nosed over on a wing tip after this kind of maneuver. Thus the origin of the taxiing diagram—the one showing the correct control positions for all wind directions—in the pilot's operating handbook of every Cessna single-engine airplane.

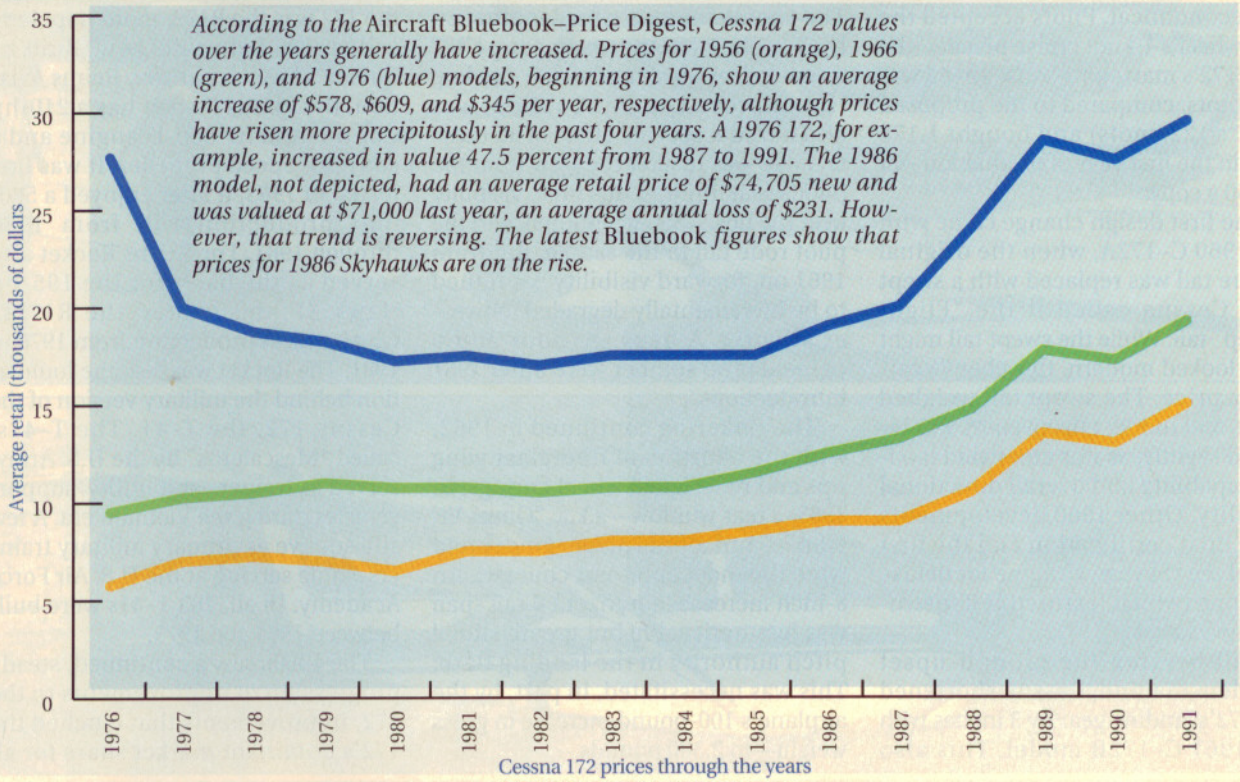
In a fit of sloganry, Cessna's marketing department dubbed the tricycle gear "Land-O-Matic," then touted the advantages of the mechanically actuated "Para-Lift" flaps. The windshield offered "picture window" visibility.

The 172 was a hit from the start. Pilots loved the airplane for its easy landings and improved ground handling. The airplane's light, well-balanced control feel made it one of the most maneuverable of the emerging flock of competing four-place, tricycle-gear singles.

The "Flight Sweep" tail debuted on the 1960 C–172A; IFR-equipped versions were dubbed "Skyhawk." The name stuck.

Cessna did windows in 1963 with the addition of the "Omni-Vision" rear window and a one-piece windshield.

According to the Aircraft Bluebook–Price Digest, *Cessna 172 values over the years generally have increased. Prices for 1956 (orange), 1966 (green), and 1976 (blue) models, beginning in 1976, show an average increase of $578, $609, and $345 per year, respectively, although prices have risen more precipitously in the past four years. A 1976 172, for example, increased in value 47.5 percent from 1987 to 1991. The 1986 model, not depicted, had an average retail price of $74,705 new and was valued at $71,000 last year, an average annual loss of $231. However, that trend is reversing. The latest* Bluebook *figures show that prices for 1986 Skyhawks are on the rise.*



Cessna 172 prices through the years

COMPILED BY JANET M. SAPPINGTON

The extended dorsal fin first appeared on the 1972 model (above). Cessna's fuselage cutaway shows off the 1965 interior.

There was—and still is—one handling quirk: In a forward slip with flaps extended, a 172 could pitch nose down, violently enough to push a pilot against his seat belt. This is caused by an upturned aileron's reducing the normally strong downwash of air over the horizontal tail. Though puzzling in its infrequency, Cessna saw the potential for trouble. Consequently, a placard is installed near the flap control: Avoid slips with flaps extended.

Apart from this rather rare, mysterious anomaly, the 172 proved virtually viceless, practical, and economical. Pilots accepted the nosewheel's 4-knot cruise penalty (the 1956 172's maximum cruise speed was 117 knots, compared to the proposed 170C's 122 knots) and bought 1,178 172s in the first year of production—at $8,750 a copy.

The first design change came with the 1960 C–172A, when the original square tail was replaced with a swept one. Cessna called it the "Flight Sweep" tail. While the swept tail might have looked modern, this change carried a price. The swept tail weighed more, and rudder effectiveness was reduced slightly, as was crosswind landing capability and overall directional stability. Other 1960 developments were float certification and the first use of the "Skyhawk" name for deluxe versions (which featured IFR instrument packages).

Still bearing the ground-upset problem in mind, Cessna shortened the 172's landing gear by 3 inches with the 1961 C–172B model. This also made it easier to board the airplane. The engine mounts were lengthened by 3 inches (to increase propeller ground clearance), and a new cowling (for improved engine cooling) was also introduced. One effect of all these changes was to alter the view from the pilot's seat. Prior to this time, visibility over the nose was exceptional, and the pilot rode tall in the saddle. But from 1961 on, forward visibility continued to be incrementally degraded, however slightly. A baggage door and a pointed prop spinner were other 1961 introductions.

The tinkering continued in 1962, with the addition of fiberglass wing tips and redesigned wheel fairings. In 1963, a rear window—a.k.a. "Omni-Vision"—and a one-piece windshield were the most apparent changes. An 8-inch increase in horizontal tail span was less noticeable but greatly aided pitch authority in the landing flare. This was necessitated, in part, by the airplane's 100-pound increase in gross weight—to 2,300 pounds.

The "Powermatic" versions of the 172 and Skyhawk also came out in 1963. These rare birds (only 68 were built) came with the same GO-300-E, 175-hp, geared Continental engines and constant-speed propellers that were used in the C–175 Skylark. The cruise speed of these P172D Powermatics was only slightly better, by 7 knots, than the standard 172s. The Powermatic never found its niche between the standard 172 and the faster 182 and was in production for just one year.

Another high-powered variant of the 172 was the R172, more popularly called the "Reims Rocket." Built by Cessna's French partner, Reims Aviation, the Reims Rocket has a 210-hp Continental IO-360-D engine and a constant-speed propeller. It was first tested in 1963; it later enjoyed a 590-unit production run from 1968 through 1981. The Reims Rocket also served as the basis for the 195-hp Hawk XP, designated the R172K, which was in production from 1976 to 1981. The Rocket was also the foundation behind the military version of the Cessna 172, the T–41. The T–41s, called "Mescaleros" by the U.S. Army, served as trainers and utility/support vehicles during the Vietnam era. A few still survive as primary military trainers, some serving at the U.S. Air Force Academy. In all, 783 T–41s were built between 1965 and 1975.

The 1960s saw a continued, steady progression of improvements to the 172, improvements that cinched the 172's dominant market share for all

time. By 1968, the airplane had a panel in the now-standard "T" configuration, center-mounted avionics, a shock-mounted cowling, a 60-ampere-hour alternator in place of the earlier generator, and electric flaps. The most radical change, however, was the decision to switch to a different engine.

In the mid-1960s, Cessna began to contemplate a snazzier replacement for the 172. This was to become the Cessna 177, or Cardinal, series. (Although the original plan was to give the first Cardinals a 172J designation.) To power the Cardinal, Cessna chose the four-cylinder, 150-hp Lycoming O-320-E2D engine. The company was so convinced of the Cardinal's success that it ordered 4,000 of the O-320s. Needless to say, it came as quite a shock when, in 1967, the prototype Cardinal missed several performance targets using the O-320.

The 172 was the big beneficiary of this miscalculation. With thousands of O-320s on hand, Cessna decided to try using them with the C–172I, beginning in 1968. It turned out to be a stroke of genius. The O-320s ran smoother and cooler than the old O-300s, were lighter, and, with four cylinders, less expensive to maintain and repair. To accommodate the new engine, 1968 172s had redesigned cowlings and new engine mounts.

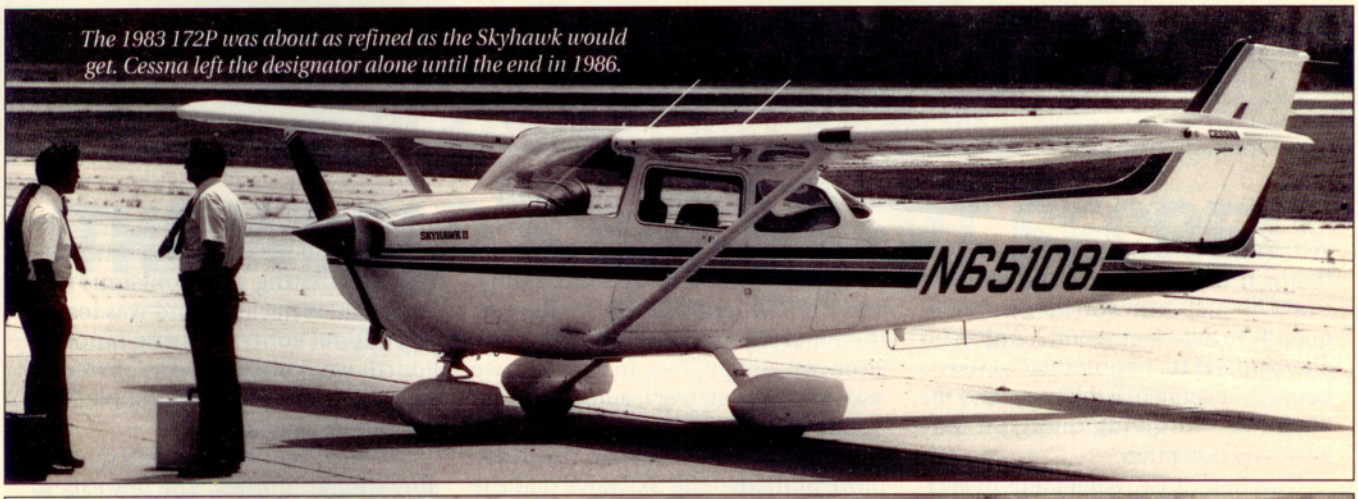
Cessna went ahead and introduced the Cardinal that same year, but the O-320-powered model lasted just one season. Subsequent Cardinals went on to have 180-hp Lycomings and retractable gear. Meanwhile, the 172 soldiered on.

In 1971, steel-tube main landing gear replaced the flat-spring gear used in previous models. The idea here was to eliminate the kind of landing gear bulkhead damage that hard landings and side loads could impart with the spring gear. This model also saw the landing light moved from the left-wing leading edge to the nose cowling. Overhead skylights were also offered for the first time.

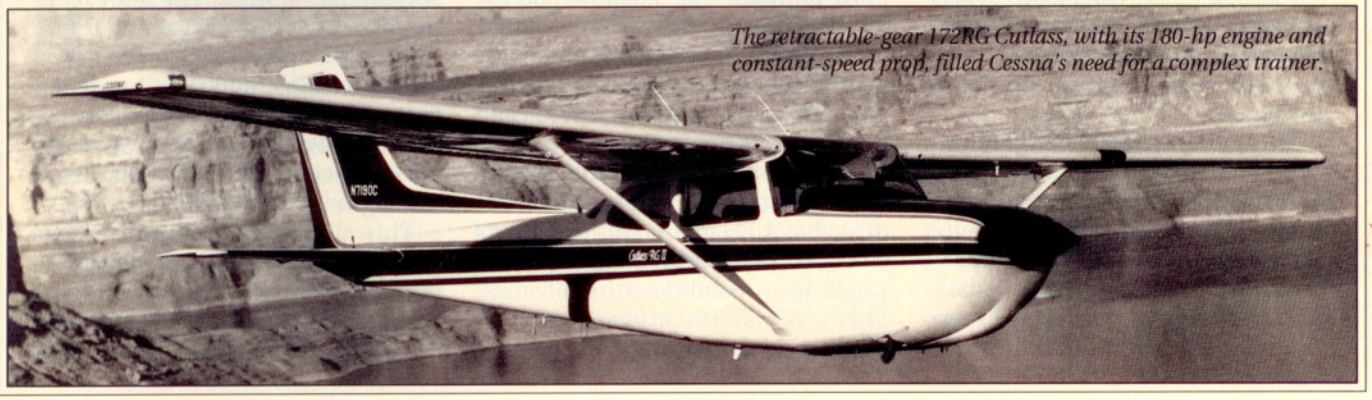
The following year, the 172's dorsal fin was extended all the way forward to the rear window. This helped virtually eliminate the nose-down pitch problem in sideslips and made the airplane much more spin resistant. According to Thompson, in his book *Cessna Wings for the World: The Single-engine Development Story* (published by Maverick Publications, Incorporated; Post Office Box 5007; Bend, Oregon 97708), Cessna received complaints from some flight instructors because of this characteristic. Demonstrations of fully developed (three-turn) spins were difficult to perform; the result was usually a spiral.

With the 1973 Model 172M, yet another aerodynamic change was introduced. In a modification that borrowed heavily from a design developed by the Robertson Aircraft Company, the wing leading edges were drooped. This produced an increased stalling angle of attack. While most Cessna singles stall at about a 12-degree angle of attack, 172s with the drooped leading edges stalled at 15 to 18 degrees. According to Thompson, the drooped leading edges produced no noticeable improvements in performance. In fact, the drooped leading edges could cause a problem: a sudden drop of a wing at the stall. Other changes for 1973 were a 1-inch reduction in propeller diameter, a locking baggage door, and the use of the Skyhawk name for all 172s. The deluxe versions were now called "Skyhawk IIs." To those in the know, the 172M is often considered one of the most desirable of the entire series.

As 80-octane fuel was phased out in the late 1970s, Cessna chose the 160-hp Lycoming O-320-H2AD engine for



The 1983 172P was about as refined as the Skyhawk would get. Cessna left the designator alone until the end in 1986.



The retractable-gear 172RG Cutlass, with its 180-hp engine and constant-speed prop, filled Cessna's need for a complex trainer.

the 1977 172N models. While these engines accomplished one goal in that they were designed for the more common 100LL fuel, they fell woefully short in another. Yes, the extra 10 hp gave the Skyhawk four more knots in cruise and an 1,100-foot boost in service ceiling, but the engine's camshaft and cam followers suffered from inadequate lubrication.

An expensive airworthiness directive was issued—AD 77-20-7—that required an inspection of the camshaft and replacement of all valve lifters. Another AD required oil pump impellers to be replaced. Yet another called for the replacement of the crankshaft. At one point, Cessna recalled all affected Skyhawks in Operation Blue Streak, a program that prorated the engine warranty up to TBO and paid for certain major repairs. But the damage was done. All these problems made Skyhawks with the -H engines the least desirable.

In 1981, the -H engine was replaced by the Lycoming O-320-D2J, which also produced 160 hp. Gone were the lubrication problems, and gross weight was upped to 2,400 pounds in the bargain.

Another Skyhawk offshoot was the 172RG, or Cutlass. This was a retractable-gear version with a 180-hp Lycoming O-360 engine and a constant-speed propeller. It was in production from 1980 to 1984. More than 1,100 Cutlasses were sold.

From 1981 to 1986 (the last year of production), the Skyhawk was designated the 172P, and improvements were basically creature comforts. Air conditioning became an option in 1981, and thicker windows, side panels, and insulation provided more soundproofing.

Flap travel was reduced from 40 degrees to 30 with the 1981 Skyhawk, in response to a spate of handling problems during go-arounds. If a Skyhawk's flaps were retracted during a nose-high, full-flap, go-around configuration, the airplane showed an untoward tendency to stall or sink rapidly. Reducing the flap travel kept pilots out of trouble by minimizing drag during such critical configuration changes. Another early 1980s aerodynamic improvement was a slight change in the horizontal tail's angle of incidence, an alteration that was advertised as improving the airplane's pitch authority. As for speed, the 172P's maximum cruise reached 123 knots, the fastest of all the 172s.

According to Cessna, unreasonable product liability awards brought down the Skyhawk—and all other Cessna piston aircraft—in 1986. The corporate view was—and still is—that the success of airplanes like the Skyhawk is now a curse. Just the thought of more than 36,000 Skyhawks must be enough to churn the ulcers of Cessna's legal department. So many airplanes, so many pilots, so many passengers, and so much flight time, all of it conceptualized as potential disaster. How times have changed.

It's been a long time since the burgeoning, innocent days when Land-O-Matic gear drew excited praise, and a self-centering nosewheel was big news. It would be nice to see those days return.

If and when they do, we'll be sure to see more new Skyhawks. Officially, Cessna has said that production of the Skyhawk and other singles will resume as soon as the laws governing product liability are reformed.

Let's hope they are. The huge fleet of Skyhawks is aging rapidly, and reasonably priced new airplanes are needed to replenish it. Apart from continuing to fulfill the need for practical four-place airplanes, the production of new Skyhawks could also stimulate a growth in the pilot population—the way it did back in the good old days.

That's something that Cessna should never forget. The venerable Skyhawk's phenomenal sales achievement formed, in large part, the financial base for Cessna's growth and later diversity. Without Skyhawks, today's fleets of Citations might never have been. □

WHERE THE TROUBLE IS

How Skyhawks crash

With just over 24,000 Skyhawks still flying, it should come as no surprise that the airplane shows up so frequently in accident reports. Any vehicle exposed to a good deal of use is bound to experience mishaps, and the Skyhawk—forgiving though it may be—is no exception.

Questions arise. What kinds of accidents are Skyhawk pilots most likely to have? And how does the Skyhawk compare with other popular fixed-gear singles?

The AOPA Air Safety Foundation's accident database was able to provide some insight on these issues. For the years 1982 through 1988, a computer sort was ordered from the database. We asked for the total number of Skyhawk accidents, plus all those experienced by the Piper Tri-Pacer (the impetus for the 172 in the first place), the Cessna 170 (the 172's predecessor), and the 150- and 160-hp versions of the Piper PA–28 Cherokee (the 172's strongest competitor). In addition, we asked for the top five leading accident causes for each of these airplanes.

As expected—because there are more of them—the Skyhawk had the most accidents: 1,610 over the seven-year period. Coming in second were the Cherokees, with 1,134 accidents, followed by the Tri-Pacer with 253 and the 170 with 180.

How did Skyhawk pilots go wrong? Again, no surprises. The biggest cause of Skyhawk accidents was the pilot's loss of control while landing in crosswinds, gusty conditions, or tailwinds. This was also the biggest cause of C–170 accidents.

In second place was low-level flying, terminating with collisions into terrain or obstacles. Third was loss of directional control during landing. Fourth was collision with obstacles after a late or delayed go-around. Fifth was fuel exhaustion.

The Tri-Pacer and 170 had remarkably similar profiles. The few exceptions include the Tri-Pacer's third-place cause (power loss for undetermined reasons) and the Cherokee's first-place accident cause—fuel exhaustion. Fourth and fifth place for the Cherokees was landing short and landing long, respectively.

This all proves that some things never change. Whether the wheel's on the nose or the tail, most accidents occur during the landing phase with a loss of directional control. —*TAH*

'THE WORLD'S BEST-KEPT SECRET'

This man wants to sell you a Skyhawk.

BY MARK R. TWOMBLY

Howard Van Bortel is a modest fellow who, in promoting his business, makes immodest claims. Consider, for example, the advertisement in which Van Bortel declares that he is "seeking every good Cessna in existence for the most cash." Or the slogan painted in large blue letters over his hangar doors: "The World's Largest 172 Dealer."

No one has yet disputed his claim to the title of used-Skyhawk sales king, according to Van Bortel, but then, who keeps track of these things? Besides, what does it matter? No question, the guy buys and sells a lot of Skyhawks. Since he got started in the business a short seven years ago, Van Bortel estimates he has sold about 700 airplanes, the vast majority of which have been 172s. Skyhawks are his speciality—low-time Skyhawks in particular—but as the supply of pampered, seldom-flown ones dwindles, he is expanding his field of view to include any and all Cessna piston-powered singles and, recently, a few 310s.

Van Bortel conducts his business from a large, sanitary hangar on the northeast corner of the Arlington (Texas) Municipal Airport near Dallas. Two long rows of international flags hang from the rafters of his hangar, a colorful travelogue of all the countries Van Bortel aircraft have gone to.

The hangar and ramp are chock-a-block with used airplanes. Nice ones, too. The inventory at the time of our visit included 35 airplanes, ranging

PHOTOGRAPHY BY THE AUTHOR

from a 150 Aerobat that was going through a prepurchase inspection for a buyer to several 172s, a Hawk XP, various 182 models, a 206, and a pristine late-model 310. The only one not a Cessna was a very nicely restored Piper PA–12. It's Van Bortel's personal airplane, the first one he ever bought. He was 16 at the time.

Van Bortel takes us on a walking tour of the merchandise, patiently noting the various attributes of each airplane in the inventory. Here's a 1984 Skyhawk, a nice blue one with all of 310 hours on it. "Factory corrosion-proofing," Van Bortel notes. The price is $84,500.

And over here, a green-striped 1963 172 with 600 hours total time. He's asking $29,500, including the Narco MK 12A and King KX 150 radios. And there's a burgundy and tan 1981 with 1,000 hours and an interior that rates a 9.5. Van Bortel can't quite remember the exact price. It's either $59,500 or $63,500.

More are parked on the ramp: a 900-hour 1974 with most of the interior removed—it's being cleaned. Van Bortel's asking $44,500. And a 1978 with 1,400 hours. This model has the O-320-H engine, which suffers from a well-publicized propensity for chewing up camshafts. "This is probably one of my best buys," Van Bortel notes—$44,500. Then he shows us a nice 1979 that lists for $57,500. It, too, has the H-engine, but only 600 cared-for hours—and a leather interior.

Van Bortel's prices are, in many cases, well above what is quoted in various used airplane price guides. In fact, he claims to not use price guides, either in buying an aircraft or selling one.

His approach to buying airplanes to resell is simple: "There are no new airplanes [Cessna singles, that is], so I handle the best ones available."

Van Bortel was born to sell something, and by all rights, it should have been cars. His father was a Rolls-Royce dealer in the Rochester, New York, area, and his sister has a Subaru dealership there. But Van Bortel has always been smitten with airplanes. While in high school, he met a flight instructor working out of a grass strip in Canandaigua, New York. Van Bortel started taking lessons—and brokering airplanes, including his instructor's. He also began looking for, and eventually bought, an airplane for himself.

A decade ago, he worked his way through Ohio State University by buying, restoring, and selling airplanes, mostly aging taildraggers. He studied accounting and was taking a course to prepare for the CPA exam in Rochester when he was distracted by aircraft on approach to the Monroe County Airport. The sound of airplanes proved to be a siren's song. "I would sit there and ask myself, 'Do I want to push a pencil all my life?'" Van Bortel asks rhetorically. The answer, of course, was no. "I got up and walked out, and it was like a great weight was lifted from my shoulders."

He immediately started brokering airplanes. Using his PA–12 for transportation, Van Bortel worked the small

general aviation airports around Rochester and western New York, wearing a fedora on his rounds. At night, he would return to his sister's house, where he was living, and make telephone calls to follow up the leads he had collected during the day.

Early on, Van Bortel recognized the potential of the Skyhawk. "When I was brokering, I'd get a Skyhawk, and it would sell immediately," he recalls. Eventually, he quit brokering and set up his own shop at Monroe County Airport, selling Skyhawks exclusively.

He reels off reasons why the Skyhawk has been his bread-and-butter seller: It doesn't burn much fuel, it doesn't need much maintenance, every mechanic can work on it [especially important for foreign sales], Cessna continues to support it with parts and customer service, and it is used by government agencies worldwide.

All of that makes the Skyhawk a good sell—and a good buy. "A lot of people," Van Bortel observes, "just don't know how much of a bargain a Skyhawk really is. It's the world's best-kept secret."

But not for long, he adds. The demand for Skyhawks is on the increase, he believes, while the supply of low-time examples is, naturally, waning. You may wince at the prices Skyhawks are bringing—Van Bortel sold one for about $100,000—but the prices will only go up. A buyer who chooses carefully can't lose on the investment, according to Van Bortel. "You will not have a problem reselling it. It's better than money in the bank."

Van Bortel finds airplanes using many techniques. He is known in the industry, and often a new-airplane dealer that has taken a Skyhawk or other Cessna in on trade will call. He also responds immediately to promising classifieds. The secret to getting there before the others is having the cash to make a deal on the spot. Typically, Van Bortel will call a prospect, or one will call him—buyers sometimes sell their airplanes back to Van Bortel when they are ready to move up—and the deal will be agreed to over the telephone. The only caveat is that the airplane pass an inspection by Van Bortel or one of his salespeople.

The inspectors know what they are looking at, too. They can detect possible repair work by knowing what kind of rivets were used in various places on the airframe. Nonstandard rivets are a sign of potential damage and almost certain rejection by Van Bortel.

The age of an airplane is not the critical factor in determining its worth, according to Van Bortel. Neither is engine time or condition or the condition of tires, wheels, brakes, or even radios. Those things can be easily replaced if they are worn. No, the critical item is the airframe. "That's our focus totally," Van Bortel declares. An airplane with damage history, corrosion, or a general appearance that suggests lack of care earns a thumbs down from Van Bortel or his agents.

The good ones, though, are snapped up, spiffed up, and put on the lot, with the pilot's door discreetly ajar to entice the pilot dreaming of his first airplane. That's just what Van Bortel wants to see. "The Skyhawk is a good introduction-to-aviation airplane," he says. "We want more people to get up in the air, and what airplane does it better than a Skyhawk?" □

EVERYMAN'S AIRPLANE

SKYHAWK MODS AND ENDS

Adding personality and performance to your 172

BY MARC E. COOK

That the world's most popular civil airplane should have a slew of modifications ought to surprise no one. Part of man's quest for identity has to do with personal expression, which becomes even more of a factor when one happens to own the most common airplane.

STOL kits

Avcon Conversions, Incorporated (telephone 800/872-0988), offers a leading-edge cuff kit for $649 that includes drooped fiberglass wing tips and aileron and flap-gap seals for $200 plus installation.

Bush Conversions of Udall, Kansas (telephone 800/752-0748), provides a STOL kit for the 172 that includes a recontoured leading edge for $800 plus installation. Flap-gap and aileron seals are also available for $240. Both Avcon and Bush claim better low-speed handling and slower approach speeds with the STOL kits.

Horton, Incorporated's (telephone 800/835-2051) STOL kit is comprised of a cambered leading-edge cuff, a pair of stall fences on the upper surface of the wing, and a pair of drooped wing tips. In addition, aileron and flap-gap seals are installed. The company claims an improvement in low-speed handling and the potential of reducing approach speeds by as much as 16 knots. Prices start at just under $1,500 for the installed kit. The modification is available for most model years of the 172. Flap and aileron kits are available separately for less than $500 installed or $230 in kit form.

The Robertson STOL kit is now being sold by Uvalde Flight Center (telephone 512/278-4481); the kit includes a modified leading-edge cuff, stall fences, and drooped ailerons, in addition to a handful of other aerodynamic tweaks, and is said to provide the 172 with tremendous short-field capabilities. Installed, the system costs a hefty $6,200 for later model (1973 and on) 172s that already have the Cessna leading-edge droop; for earlier models, the price is $7,500.

Tailwheel conversions

In addition to the STOL kits, both Avcon and Bush Conversions can help you take your 172 from tricycle gear to a taildragger. This involved kit includes a new tailwheel assembly, reworked landing-gear box structure, and tailcone beef-ups. Both companies claim better soft- and rough-field performance, as well as slightly improved climb and cruise for the modification. Avcon's kit runs $2,795, and Bush's lists for $2,250 to $3,200, depending upon which model 172 you're starting with. Count on $2,000 or so for installation labor for either kit.

Another source for the tailwheel Skyhawk is ACT (Aircraft Conversion Technologies, Incorporated [telephone 916/645-3264]), in Lincoln, California. Available for the 172A through 172P models, the conversion runs about $8,200 installed or $3,200 in kit form. The company claims an 8- to 10-knot cruise-speed increase and a 100-fpm-better climb.

Engine conversions

Certainly one way to get better cruise and climb from the 172 is the old-fashioned way: Add more horsepower. After all, Cessna did it several times in the 172's lifetime—the Powermatic versions (175 hp), the so-called Reims Rocket (210 hp), the Hawk XP (195 hp, upgradable to 210), and the Cutlass (180 hp in both fixed-gear and retractable forms). The aftermarket has

COURTESY OF AIRCRAFT CONVERSION TECHNOLOGIES, INC.

Taildragger conversions are offered by three companies; all claim performance advantages over trigear.

picked up on this formula of more is better, and two basic types of power-upgrade kits can be found—one that essentially replicates the Cutlass, and another, principally for older 172s, that swaps out the Continental O-300 or Lycoming O-320 for a Lycoming O-360 and a constant-speed propeller.

Air Plains Services of Wellington, Kansas (telephone 316/326-8904), will happily swap your O-320 for the 180-hp engine and Sensenich propeller for $18,500, which includes a factory-new powerplant. If you don't have that kind of clout, you might want to buy just the kit for $3,495 and hunt out your own O-360; this choice includes all the paperwork and hardware and propeller for the conversion. Among the advantages of the additional 20 or 30 hp, according to Air Plains, is a 13- to 16-knot cruise-speed increase, 300- to 400-fpm-better climb, and a gross weight increase of 200 to 250 pounds.

(Another modification offered by Air Plains allows owners of 1977 to 1980 Skyhawks to swap out the camshaft-and-lifter-eating O-320-H2AD engine for a -D2J model. This kit runs $750.)

Avcon Conversions has both constant-speed prop and fixed-pitch versions of the 180-hp upgrade available for all models of the 172. Prices range from $1,500 to $2,600 for the kit, and installation time falls in the 20 to 55 man-hour range, depending upon airframe model and engine choice. Although the constant-speed-propeller version of the kit can be $2,000 to $3,000 more expensive (because of the propeller, governor, and related hardware), Avcon says it will outperform the fixed-pitch retrofit across the board. Along with the engine swap comes a maximum gross weight increase of 150 to 200 pounds, depending upon the model.

Bush Conversions' modification will allow you to add the 180-hp engine to most models of 172; some of the swaps allow use of a constant-speed prop while others use a fixed-pitch prop. Conversion kits range from $1,100 to $2,850. Gross weight increases are also available.

Penn Yan Aero Services of Penn Yan, New York (telephone 315/535-2333), also provides a 180-hp upgrade for the Lycoming-powered Skyhawks. This modification, which can be purchased installed or in kit form, runs $16,200 to $19,300 installed with a factory-new engine and your old motor in exchange; the price difference takes into account the lower value of the -H2AD engine core.

COURTESY OF FLINT AERO, INCORPORATED

The Flint Aero tanks mount in the outer wing panels and provide an additional 12 gallons per side.

As with Air Plains, Penn Yan can swap out that -H2AD engine for a new 160-hp -D2J or -D3J variant, for $16,000 exchange, and will trade the 150-hp O-320 for a 160-hp version for an installed price of $11,000 to $14,000, depending upon the model.

Fuel systems

Of course with the extra horsepower available for the 172, it makes good sense to increase the stock airplane's fuel capacity. (It's not a bad idea even for the unmodified airplanes.)

Aircraft Conversion Technologies can add as much as 7 gallons to each of the 172's main tanks; kit price is $1,795 uninstalled, exchange, or $1,995 outright.

Flint Aero, Incorporated (telephone 619/448-1551), offers 12-gallon wing tanks for the 172 that use electric pumps to move the extra fuel into the existing main tanks. The basic kit starts at $2,900 and is installed in the outer wing panels.

Air Plains Services will install the aforementioned Flint tanks in your airplane for approximately $4,200.

O&N Aircraft Modifications (telephone 717/945-3769) has an 18-gallon baggage compartment tank for the 172F through 172P models. The kit alone costs $1,350, or you can have O&N perform the installation for a total price of $2,150; the company says it can install the tank in one to two days.

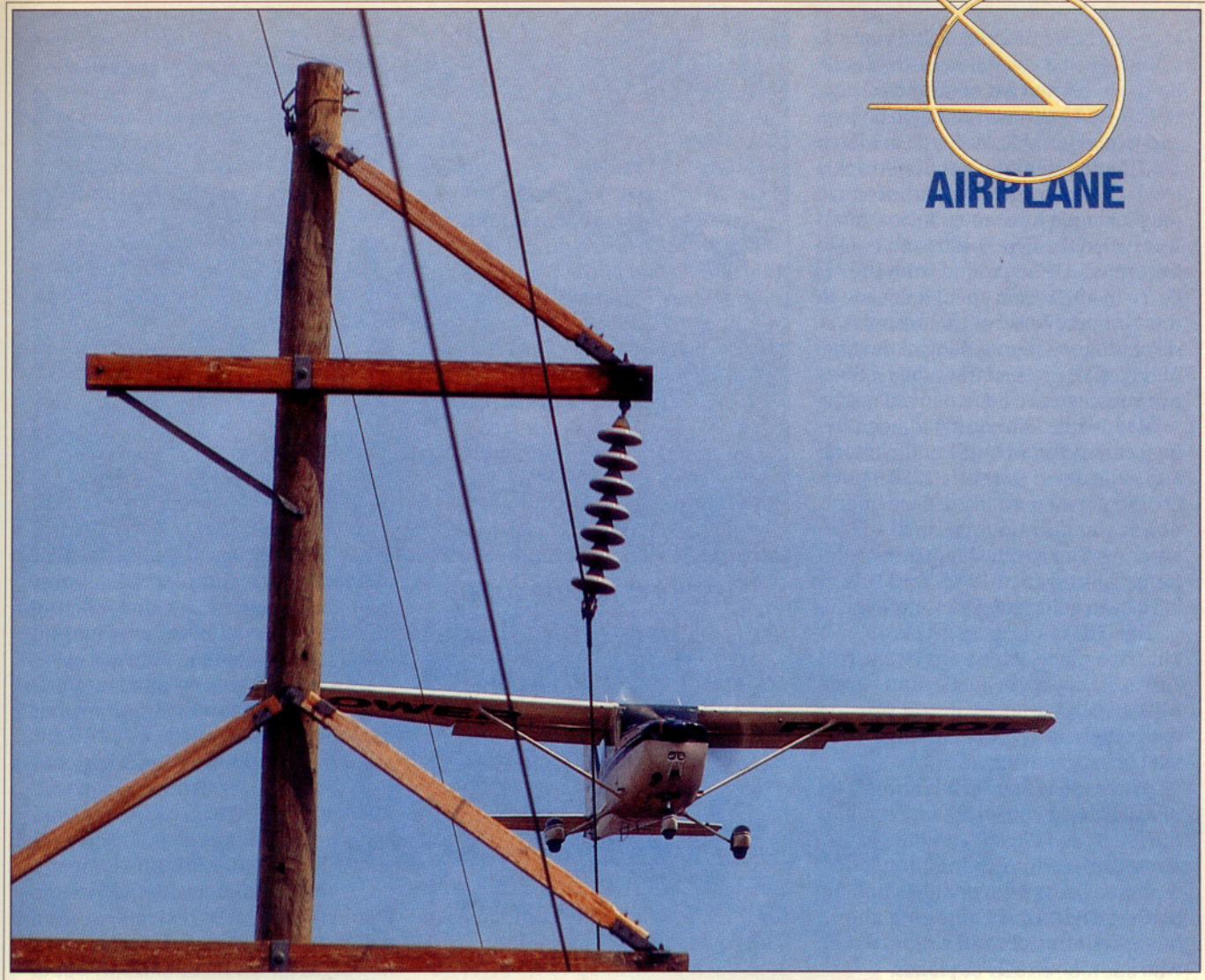
Speed kits

You don't have to add horsepower to a Skyhawk to make it more fleet than the average bird, because there are several companies that provide kits whose sole purpose in life is to make the aerodynamically dowdy 172 a bit slicker. (In addition, the aileron and flap-gap seals sold by the companies listed above in the STOL category are said to boost cruise and climb slightly.)

Aircraft Speed Mods, Limited (telephone 919/354-6630), though specializing in the Cardinal, offers airframe slick-ups for the 172. (The following modifications are also available through C² Enterprises [telephone 701/727-9554].) In addition to providing fiberglass replicas of late-model Cessna wheelpants, the company sells brake fairings and will soon introduce a nosewheel-pant mod called Fancy Pants. Other go-fast tidbits like ADF loop and fuel-drain fairings are available. Prices start at $12 each for the drain fairings and run up to $225 per wheelpant and to $517 for the Fancy Pants kit. The exact performance gains vary by individual airplane; gains of up to 16 knots over a stock airplane sans wheelpants are possible, according to the company.

Maple Leaf Aviation of Brandon, Manitoba, Canada (telephone 204/728-7618), also sells aerodynamic kits for the 172, consisting of similar components as those listed above. Kit prices start at $40 for the ADF loop cover and move upward to $225 for the Cessna-type wheelpants and $500 for the modified nosewheel fairing. In addition, the company sells an exhaust pipe fairing that is said to increase cruise speed and improve engine cooling; it sells for $195 uninstalled.

There's obviously quite a variety of modifications available for the 172, and we have just touched on a few of them—there are also instrument panel upgrades, shoulder harness retrofits, and myriad other interior and exterior improvements available. All of which should give the 172 owner the opportunity to make his airplane as individual as his time and budget will allow. □



WORKHAWK

Captain Fuzzzo flies the lines.

BY WILLIAM L. GRUBER

IF you've got a job that needs to be done by small airplane, from power-line patrol to forest-fire spotting, Hanover Aviation in Ashland, Virginia, most likely has the aircraft and pilots for the mission. But if you call company President Caton A. Shermer to discuss your needs, don't ask for Caton or even Mr. Shermer; everybody around Hanover County Municipal Airport and its environs knows him simply as "Fuzzzo."

He picked up the moniker from his boyhood baseball coach, and fortunately or unfortunately, depending upon how you look at it, it stuck. He still wears a crew cut, so the name still makes some sort of sense. And he gets a lot of mileage out of it—his airplanes and business cards bear the trademark "ZZZ Ranch," and his pilots and observers like to point out to the uninitiated that "the middle 'Z' is silent."

I first met Shermer when he flew up to Frederick Municipal Airport in his 1960 Piper Aztec. What do you expect of a guy named Fuzzzo who speaks with a syrupy Southern drawl and does most of his flying a few feet above the ground? When he climbed out on the wing, wearing green plaid pants that would make your eyes water and a ball cap (bearing the ZZZ Ranch logo, of course) cocked back on his sparse scalp, I thought my worst doubts had been realized. What kind of a yahoo (it's pronounced yay-hoo in Virginia, I'm told) was this Fuzzzo character, anyway? Then I noticed the green sweater and green tie and remembered—with a delayed appreciation for Shermer's sense of humor—that it was St. Patrick's Day.

Turns out Shermer is no yahoo, nor yay-hoo, either. What he is, is an accomplished airman with more than 14,400 flying hours, much of them under very demanding conditions. He

PHOTOGRAPHY BY MIKE FIZER

started flying in 1962 in Richmond, which is just a few miles south of Ashland. He earned his commercial certificate and instructor rating in college and joined the U.S. Air Force in March 1967 (coincidentally, on St. Patrick's Day). His more than 12 years of active duty included three tours in Southeast Asia, where he flew F–100s and F–111s in combat. He separated from the Air Force in 1979, then spent a decade in the Air Force Reserve as a reserve assistant to the Virginia Wing of the Civil Air Patrol. He retired from the reserves two years ago as a lieutenant colonel.

Meanwhile, Shermer had been flying Learjets for an outfit in Richmond and, starting in the early 1980s, power-line patrol for a fixed-base operation at Hanover County. He liked it so much, as they say, he bought the company. That was in 1984, and things have been going great guns ever since.

The FBO is a relaxed, old-fashioned kind of a place, with a snack bar that serves home-style meals, and where pilots with Quiet Birdmen pins on their lapels hang around doing a good deal of hangar flying.

Better still is that there's a whole lot of real flying going on, and most of it is the fun kind: VFR, close to the ground, stick-and-rudder flying. You won't find many guys with epaulets and big leather flight cases lounging about, but you definitely will run into men who know how to fly airplanes.

And the airplane Shermer chooses for most of his rigorous operations is the Cessna 172.

Shermer has five Skyhawks that he employs in a variety of roles. The dominant mission is power-line patrol for three public utility companies in Virginia and Maryland. But the 172s also earn their keep in a variety of other jobs that go beyond the usual flight school duty in which most of us picture them. These include: forest-fire spotting; aerial photography and photo mapping; reforestation and deforestation photography; aerial study of gypsy moth and pine bark borer beetle infestations; traffic reporting and radio promotions; plus video and still aerial news photography.

There's a whole lot of real flying going on, and most of it is the fun kind: VFR, close to the ground, stick and rudder.

Fuzzzo Shermer with one of his power-line-patrol aircraft (above). Headquarters of the "ZZZ Ranch" (below).

To keep things even more interesting, Shermer runs a flight school that has seven Cessna 152s, a 172RG for complex/commercial training, and the Aztec for multiengine work. There's also a 1946 Ercoupe that you can rent for 35 bucks an hour.

While the other missions, mostly done under contract with the Virginia Department of Forestry and area paper manufacturers, help Shermer buy avgas for his Aztec and stay out of the poorhouse, the bread-and-butter work for the Skyhawks is power-line patrol. Evidence of this is the 24-inch lettering on the top and bottom sides of each airplane's wings that spells "POWER PATROL." That is an attempt

to prevent civilians from getting too upset when they see an airplane flying at treetop level or disappearing behind a hill, and perhaps, as one wag observed, "to keep the moonshiners from shooting at them."

The aircraft may not come under fire, but it is amazing, one soon discovers on power-line patrol, how many hunters mistake electric insulators for deer, rabbits, ducks, and other game. Damage from gunfire is one of the leading problems that observers look for. Shermer even discovered an arrow stuck into a pole crossarm on one patrol.

Patrols are flown using two-man crews—a pilot and an observer. In general, the observer watches the lines, and the pilot watches where he's going. Patrols are usually flown at about 50 feet above the poles or above the highest obstruction. Strict safety rules and procedures—i.e., always patrol gradually rising terrain downhill, otherwise it may rise faster than you can climb—are drilled into the pilots, who must fly as observers for 10 hours in each area of operations and undergo extensive indoctrination before being turned loose as pilot in command on patrols. The results of not following those procedures can be serious; the company's only two mishaps, a collision with power cables and a crash into rising terrain, occurred because the pilots broke the rules (fortunately, nobody was killed in either accident).

"I don't perceive it as dangerous. If it's done properly, the element of danger is minimal," says Shermer. "If it's done and done right, it's like flying the downwind in the traffic pattern. It's not as relaxing as cruise. You can't let your mind wander."

One man intimately aware of the consequences of not doing it right is W. F. (Chuck) Dunnington, one of Shermer's top observers. Dunnington was flying as observer on the Skyhawk that went into the hillside, but he was back flying patrols again before doctors had removed the cast supporting his torn knee ligaments.

"The first time I got in the airplane, I loved it," says Dunnington, who as a manager at the Rappahannock Electric Cooperative in Bowling Green, Virginia, began flying patrols more than 10 years ago with the previous operator. He enjoyed the flying so much that he earned his own pilot certificate in 1985, although he lacks the commercial certificate necessary to act as PIC on patrols. Still, being an observer is satisfying in itself. "I think it's the most fun thing I've ever done in my life," he says. "It's exciting. I'm probably half crazy, but I love it."

Dunnington looks for "anything that can cause a problem," such as encroachments on the power-line right of way (he's found people building swimming pools and buildings on the right of way, for example), overhanging trees or cranes in backyards, bad insulators, bad wires, etc. The most unusual thing he ever found was a dead fish sitting atop a high pole. After mulling that one over (there hadn't been any 100-year floods lately), he decided it must have been the abandoned meal of an eagle or osprey.

Pilots and observers work closely as a team, crew coordination being key to mission success and safety. They communicate through a rehearsed set of verbal and hand signals. The observer tells the pilot where he needs to be, and the pilot puts him there—if safety will not be compromised. Likewise, the pilot is primed to react immediately if the observer spots an obstruction, responding to standard commands like "break right."

"What I look for in a pilot is a person who has been on board here, and I get a feel for him and the way he handles an airplane," says Shermer.

What he looks for in an airplane comes in a neat package called the Cessna Skyhawk. "It's a right match of power and capability," Shermer says.

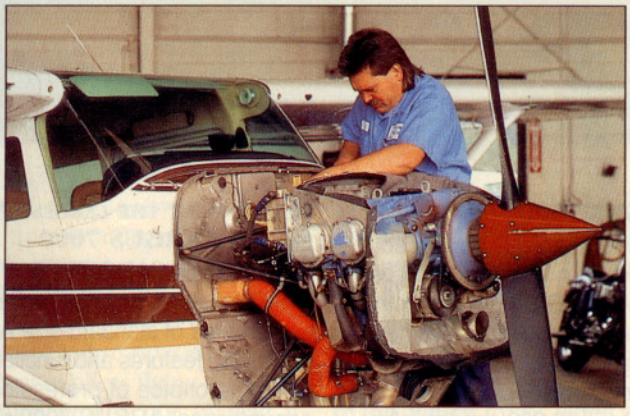
Shermer has tried out other airplanes on power-line patrol, but they all came up lacking in one way or another. He tried the 152, but it lacked the power needed to climb hills, and its flap extension speed was too low to use flaps on patrol. He tested the 172RG, but the gear warning horn kept going off. A Citabria got an audition, but its tandem seating proved an obstacle to the cockpit communication so critical to safety and efficiency on patrol. Always, Shermer came back to the trusty 172.

Patrols are flown with 10 degrees of flaps. The flaps provide better stability, reduced speed, and help the airplane ride out bumps better, says Shermer. On the later Skyhawk models, the flap extension limit is 110 knots, and the aircraft climbs better with one notch of flaps, Shermer maintains.

"Also, there are the collateral missions I can do with the Skyhawk," he says. Three of his 172s have camera holes in the rear floor, providing accommodations for a backseat photographer, for example.

Maintenance on the patrol aircraft, each of which has about 5,000 hours total time on the airframe, surprisingly involves no special TLC. They receive routine 100-hour inspections and other work only as needed. "The special thing," Shermer notes, shaking his head, "is cleaning all the bugs off the leading edges and the windscreen."

All of which adds up to low maintenance and very high productivity. You can't ask much more of a workhorse than that. □



On power-line patrol over Virginia (above). Shermer has his own shop for routine maintenance.