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Start Holding Up Your End, FAA

It's always interesting talking with the creative folks who develop major aircraft modifications and conversions about going through the process of getting STC certification from the FAA. I don't know how many times I've heard a new STC-holder comment that had he known of the hassles, conflicting instructions, interminable delays and costs he'd face in dealing with the FAA, he'd have never sought an STC.

I can't help but wonder how and why the FAA has turned what should be straightforward, objective demonstrations of regulation compliance into exercises that rival the travails of a character in a Kafka novel.

Right now, before the effects of the sequestration budget cuts take hold, the mod shops tell me that getting an STC takes more than two years if you've done everything right and, more importantly, are lucky.

That's crazy. The regs and procedures for issuance of an STC have been in place for years. The approval system has run off the rails.


United States of America
Department of Transportation -- Federal Aviation Administration
Supplemental Type Certificate

The computing capability and software for flight and ground test data collection, reduction, analysis and presentation has improved dramatically in the last 20 years, yet FAA decision-making on applications has slowed to a where a crawl would be a good pace.

Industry is holding up its end of the regulatory deal. It's hiring DERs (FAA-approved Designated Engineering Representatives) to reduce the FAA's workload on analysis and approval of technical data. It's taking advantage of the computer revolution to present test results in the clearest and most comprehensible fashion possible.

The FAA isn't holding up its end of the regulatory deal—the part where it acts professionally, in a timely manner. The FAA personnel at the tip of the arrow, working directly with industry, tend to be knowledgeable, competent engineers. Yet, they are buried in time-wasting, morale-sapping administrative tasks. Plus, having been second-guessed on minutiae so often by middle management, they follow the path of least resistance and send all but the most routine decision up the chain of command. What should be reviewed in days can take months.

To make matters worse, the reports of middle managers moving the goal posts after all of the testing has been done and the data presented are too common. The unfortunate scenario is that one of them will decide, out of the blue, that even though the safe test protocol has long been set at 25 spins in each direction or 30 cooling climbs to altitude—and those were the numbers agreed upon between the FAA and the applicant for the STC—that now there must be 50 spins or 60 cooling climbs and additional instrumentation will have to be put on the airplane.

Those who feel the need to add meaningless tests are not doing so out of fear of litigation—FAA employees can't be held personally liable for a certification decision. Why do they do it? I don't know. Ego? Incompetence? No matter the cause, the effect is toxic.

The mod shops don't dare complain because of fear of retaliation. They know that it's virtually impossible to fire anyone at the FAA, so they grit their teeth and pass the FAA-induced costs to us, the users.

I recognize that the FAA has no obligation to support aviation—yet, as a public servant, it has an obligation to carry out its regulation activities professionally and not harm the aviation-using public through toleration of incompetence or lack of professionalism within.

I wonder what will happen next. I watch the level of anger mount at the cost of the FAA's unwillingness to do its job. I see the negative effect on safety as pilots fly less as costs mount, increasing the risk of accidents. With sequestration budget cuts, the delays are only going to increase unless the FAA decides to police its own house. I'm not optimistic. —*Rick Durden*

Pulse Oximeters

Your article on pulse oximeters in the March issue correctly pointed out that they increase safety, however, there is one situation where they do not and can give a pilot a false sense that all is well. The symptoms of carbon monoxide (CO) poisoning are the same as the symptoms of low blood oxygen—hypoxia—a feeling of well-being.

CO poisoning causes a pulse oximeter to give a normal or high blood oxygen concentration reading, the CO displaces the oxygen in the blood. This can cause a pilot who might otherwise be concerned to see a normal blood oxygen reading and get a false sense of security.

To be protected, a pilot should also carry a sensitive CO detector in the airplane.

I agree that the FARs are inadequate to protect a pilot against the dangers of hypoxia. There is significant variation amongst pilots as to tolerance to altitude. Pulse oximeters will definitely convince more pilots to use oxygen.

David Wagner
Via email

Aircraft Tugs

The article on aircraft tugs in the April issue missed a good tug that I like. Redline Aviation produces a high-quality "power-drill"-type tug called the Sidewinder. I've had one for years.

It utilizes a 28-volt lithium battery to power a Milwaukee drive unit that easily moves my Bonanza up a slope into my hangar. Even though it's more expensive than the units you covered, I think the way it's made makes it worth the price. It folds in half, making it portable, and I've even seen one pushing a Cessna Citation.

Al Boyce
Via email

GTN Survey

A year ago, I had Sarasota Avionics install a GTN750/GTN650 in my Cessna 421. While its touch screen is more advanced than what I'd been flying, the underlying foundation of the GTN series did not come from the more advanced GNS480, but the dumbed-down GNS430/30. With the GNS480, I was able to accept a "full route clearance" and enter it as it was given. With something such as "radar vectors to V24," I just went to my flight plan and put in V24, and the system would come up with all the exits automatically.

With the GTN750, you have to find an intersection behind you that is on V24 and enter it. How backward can you get?

The GNS480 would alert me when the localizer was alive, a nice safety feature when the workload is high. The GTN does not.

The GNS480 would audibly warn when I was 500 feet above DA; the GTN 750 does not.

When Garmin came out with its first update to the units, I had my shop do it as I assumed they would have some of the upgrades I'd been requesting. Not only did they not have any new features, they disabled some that were there before the update—so I had to pay the avionics shop to restore the original software.

I feel as if suggestions to Garmin fall on deaf ears.

You would think I hate the GTN series, but that is not entirely true. I just think Garmin chose the wrong platform for creating it.

Gary Sage
Via email

Paper VFR Charts

A quick thank you for your article on paper VFR charts in the April issue. I have subscribed to two sectionals, an area chart and my local AFD for years. It never occurred to me to shop for price on such a small purchase. I noticed in your article that MyPilotStore sold the same items for less than half of what I'd been paying once shipping is included. That's over $30 a year for charts.

Thank you for remembering the small consumers in aviation.

Dean Shutt
Via email

The timing of your article on paper VFR charts couldn't have been better. After using the very good Air Chart Systems product for years, just before I read your article, I was notified by Air Charts that it was going out of business. (*We got word of Air Charts' impending demise just after the April issue went to press—Ed.)*

I know, I know, with my iPad loaded with charts, I don't need paper charts, having an up-to-date backup that can't overheat or run out of batteries or crash is cheap insurance. Look like it's time to check out the Tri-Nav product. Thanks!

Aaron Redinger
Via email

A good source of paper VFR charts is Duracharts. They print the charts in the same size and format as Aeronav, but on tear-resistant, plasticized paper. Prices are similar to other companies, and I no longer have to spend time taping up my charts along the folds as they wear out.

Andy Travnicek
Via email

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Turbonormalized P210: Fast, Efficient, Quieter

Vitatoe Aviation hangs an easy-breathing, cool-running, turbonormalized IO-550 on a P210, giving it a strong rate of climb and turbine speed at altitude.

by Rick Durden

Vitatoe Aviation's turbonormalized P210 conversion may just have turned the Cessna P210 into the airplane it should have been all along. I've liked the P210 ever since I first flew it in 1979. It's fast, carries a good load, has honest handling and the pressurization spoiled me.

However, the first part of any flight always seemed to be a battle between a decent rate of climb and engine cooling. When going fast enough to keep CHTs out of the stratosphere, the rate of climb was usually around 400 or 500 FPM. It took a lot of fuel and time to get to altitude. This mod fixes those problems and turns the airplane into a 200-knot cruiser.

Successful entrepreneur, former drag-racer and self-described gear head, Larry Vitatoe faced the heat-versus-rate-of-climb conundrum with his P210—he liked everything about the airplane except for the constant battle with cooling during the climb and the need to sometimes step-climb on hot days.

About four years ago, when it was time to overhaul the TSIO-520 up front, Vitatoe decided to act on his idea of getting an STC for a turbonormalized IO-550P in the P (and T) 210. He reasoned that by installing the high compression ratio IO-550 and using the existing turbocharger but only using it to turbonormalize the engine—maintain ambient sea level manifold pressure up to altitude—rather than ground boost the engine—boost the manifold pressure above ambient—the engine would run cooler and more efficiently than the TSIO-520 in the T and P210.

After doing his homework, which included spending time with Tornado Alley Turbo's turbonormalizing gurus George Braly and Tim Roehl, Vitatoe set his team to work.

CHECKLIST

- Turbonormalizing drops operating temperatures in climb and cruise.
- Cruise speeds in the high teens are with 10 knots of the turboprop P210 mod.
- Prop change cuts takeoff overflight noise level by 2.5 decibels.

THE INSTALLATION

Over the course of two-and-a-half years, they came up with an installation that mated with the existing Inconel exhaust system used by Cessna. They used dual intercoolers to keep induction air temperatures to not more than 135 degrees F, moved the altitude-compensating fuel pump to a location where it was easily accessible and adjusting fuel pressure would no longer be a four-hour job. They then put the induction system on top of the engine where it would be in a cooler operating environment and used the throttle body from a TSIO-550 engine.

As installed in the modified T and P210, 31 inches of manifold pressure generates 310 HP on the turbonormalized IO-550 as opposed to the 36.5 inches required on the TSIO-520, allowing cooler running at high power settings. An incidental benefit is that the IO-550 has a 2000-hour TBO as opposed to 1400 or 1600 hours for the TSIO-520s used in the stock P210s.

The existing McCauley prop could not meet vibration requirements in the new installation. Hartzell, "just up the road from us," as Vitatoe put it, was willing to get involved and came up with two scimitar props, one 80 inches in diameter, the other 82 inches. Both props cut takeoff noise by 2.5 decibels, which doesn't

Vitatoe's turbonormalizing mod boosts the P210's cruise to 200 knots in the high teens

seem like much, but makes a noticeable difference for a 210 in an increasingly noise-sensitive world.

Atlantic Aero's six-point engine mount, similar to what Cessna used for the last model of the 210, the R proved to reduce vibration and was chosen for the Vitatoe mod.

The STC for the conversion for the P210N, T210L, M and N was received in the summer of 2011. Vitatoe performs the changes at its facility at Pickaway County Airport, Circleville, Ohio. While I was there, the hangar was full of airplanes being converted. I was told there is a short waiting list. The conversion requires 14-16 weeks. Thus far, the P210 has proven to be the overwhelming favorite for the mod, with only one T210 having undergone the engine swap.

COST

The basic price of the upgrade is $115,760 for the P210N or $118,560 for the T210L, M or N, which includes a remanufactured TCM IO-550-P6B engine—TCM accepts a TSIO-520 for core credit—with a single 100-amp alternator (dual 60-amp alternators are an option at extra cost), choice of 80- or 82-inch Hartzell prop, six-point engine mount, pressurized magnetos, overhauled prop governor, overhauled turbocharger, overhauled boost pressure relief valve, dual intercoolers, TCM balanced upper deck fuel injection system, TCM altitude compensating fuel pump, new baffles and associated hardware for the installation.

The mod involves a number of other changes, such as some rework of the cowling and nose bowls, and the tail pipe exit area of the lower cowling.

The STC requires that the airplane have an engine monitoring system that displays and records engine data. Most coming in for the mod already have an acceptable engine monitor. If not, Vitatoe Aviation is an AuRACLE dealer.

There are additional options available—the engine will handle dual alternators, dual vacuum pumps and air conditioning. Vitatoe can install electric or fluid prop deicing and some owners specify a new, rather than remanufactured, engine. For those owners who desire paint, interior and/or avionics when doing the engine upgrade, Vitatoe will help coordinate the work with shops that specialize in those areas.

Vitatoe noted that no two airplanes his shop has looked at are the same. Every one has gone through some changes since new, from avionics through auxiliary fuel tanks to TKS deicing systems. It is one reason that every airplane is weighed as a part of the engine mod—Vitatoe went on to say that every airplane has also weighed more than its owner thought, by as much as 100 pounds.

WEIGHT

The engine change adds from 7 to 35 pounds to the airplane, depending on the equipment on the original airplane. The airplane I flew had a post-mod empty weight of 2771 pounds, which Vitatoe said made it one of the heaviest as it had a number of options, including air conditioning and a radar pod. With a 4016-pound maximum ramp weight, its useful load is 1245 pounds. Loaded, with full standard tanks—89 gallons usable, 534 pounds—711 pounds can be carried in the cabin, three 200 pounders plus over 100 pounds of stuff.

The STC provides a supplement to the POH, however, it is primarily operational. From a performance standpoint, it simply states that the modified airplane will perform as well or better on takeoff and climb than the standard airplane. I was to find out that takeoff and climb performance has improved.

For cruise, the maximum allowable horsepower is 262, which is 75% of the maximum capacity of the engine, 350 HP, although it is derated to 310 HP max continuous in this application. 362 HP is obtained at 30 inches MP, 2500 RPM and 17.5 GPH fuel flow LOP. In our flight, I saw a cruise of 202 knots at 16,000 feet at that power setting. That gave a range, with VFR reserves, of just over 700 NM. Not bad for a pressurized, known icing, radar-equipped, piston single.

There is an interesting limitation on the installation—at power settings above 26 inches MP, fuel flow must be either greater than 30 GPH or less than 17.6 GPH.

Vitatoe told us that when he started working on the conversion, his target was a 200-knot cruise at FL200. My numbers showed that he exceeded his goal.

Preflighting the airplane is conventional. A person familiar with P210s will notice that the cowling has been cleaned up, a non-icing NACA scoop is used for induction air and the prop bears the distinctive look of the Hartzell scimitar design.

Inside, the only difference that shows immediately is that the high side of the auxiliary fuel pump switch is no longer spring-loaded to off. Vitatoe explained that if the engine-driven fuel pump gives up the ghost, it's necessary to turn on the high side of the aux pump. Having to physically hold the switch on made no sense, thus the spring was removed.

I've flown various IO-550 conversions and have found them to be remarkably smooth—Vitatoe's P210 installation proved to be no exception. It was dead smooth at all power settings from idle up. Even running well lean of peak (LOP), it simply

Larry Vitatoe with two views of the turbonormalized IO-550 installation in the P210, showing the induction system and the two intercoolers.

never ran rough, although I should probably credit the GAMIs for the LOP smoothness.

Takeoff comes after a minimum of 100 degrees F oil temperature and 200 degrees F CHTs are reached. At full throttle, the automatic waste gate control sets the manifold pressure and fuel flow to 31 inches and 37 GPH, although there may be a small overrun on the first takeoff of the day. There is a pop-off valve that takes care of any significant overboost.

TAKEOFF AND CLIMB

The airplane was loaded to 200 pounds below gross weight on a day that was 15 degrees F below standard temperature. Takeoff acceleration was slightly better than I would expect in an unmodified P210, with more right rudder required. More rudder trim was required when transitioning to climb, cruise and descent than in an unmodified P210.

All power controls are moved full forward at the beginning of the takeoff roll and left there until leveling off in cruise. I did not have to touch anything until leveling off at FL220, which, in my opinion, is how power management should be—there are enough demands on the pilot's attention, particularly when departing from a terminal area.

Other than a greater need for rudder, handling is pure Cessna P210—well-behaved and harmonized in all axes throughout the envelope, but heavy. The airplane is utterly predictable and will handle impressive crosswinds. The controls are effective—it just requires effort to displace them. That solidity and predictability may be one of the reasons the airplane has long been popular.

PERFORMANCE

Once the gear and flaps were up, a cruise climb of 120 knots was set. I did not see less than 900 FPM all the way to FL220, even though the airplane picked up about a quarter inch of rime ice between 6000 and 8000 feet. The time to FL220 was just over 20 minutes. In my experience, an unmodified P210 would take twice that time.

The hottest CHT I saw in the climb was 320 degrees F, and the hottest inlet temperature I observed was 90 degrees F.

At FL220, I made cruise speed in runs in opposite directions. In an airplane with a radar pod and a light layer of rime ice, cowl flaps closed and power set to 326 HP LOP (30 inches MP, 17.3 GPH and 2500 RPM), the speed settled at 152 knots indicated, 212 knots true. TIT was 1540 degrees F; the hottest cylinder was 358 degrees F. Vitatoe said that when the OAT is above standard, the CHTs will run at what he considers to be max—380 degrees F—and it may be necessary to partially open the cowl flaps.

At this altitude, the TN P210 is within 10 knots of being as fast as the advertised speed of the Silver Eagle turboprop mod of the P210 while burning 7 fewer GPH.

At 16,000 feet, with 326 HP set using the same MP, RPM and fuel flow, I observed a TAS of 202 knots, the hottest CHT was 316 degrees and TIT was 1544.

I also did a check at 8000 feet, as it is often asserted that turbos are a liability below 10,000 feet. With the lower exhaust backpressure of turbonormalizing versus ground boosting, I am not convinced that cruising at lower altitudes hurts economy. My observations, again at 262 HP, were a TAS of 175 knots at 17.4 GPH and a highest CHT of 297.

While higher is generally more efficient, even with a 37 GPH fuel burn in the climb, lower isn't going to eat you up with fuel bills, especially when there are strong headwinds up high.

CONCLUSION

It looks like Vitatoe Aviation has hit a long ball in converting the P210 to a turbonormalized IO-550. The TN IO-550 has been a success in the Bonanza and Cirrus—it looks as if this can continue the trend.

With prices of P210Ns under $200,000, the idea of being able to have a pressurized single that cooks along at turbine speeds in the flight levels for $300,000 is attractive.

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Autopilot Repairs: Worth a Try

Avidyne's drop-in DFC90 betters the performance of an existing S-TEC 55. For some older systems, rebuilding is cheaper than replacement.

by Larry Anglisano

It wasn't long ago that an entry-level, two-axis autopilot was priced around 10 grand—including installation. Today, that price is double. Add some options and the bottom line could soar toward $30,000.

These big proposals have many owners repairing older autopilots. But as service parts for older systems become obsolete, repair costs are high, downtime is increased and factory flat-rate pricing makes the repair questionable.

In this article, we'll look at the reality of autopilot repair versus replacement. For basic systems, we think replacement is a better, long-term option.

MAJOR-LEVEL REPAIRS

We spoke with several respected autopilot repair facilities for their view of common, serviceable models. Surprisingly, repair capability for vintage systems—including Cessna/Sperry and Piper/Century models—is good. It helps to use a shop that does high volume. That's because they'll have a good supply of core units for accessing hard-to-find parts. Better yet, many vintage systems can be returned to near-new condition. Still, everyone we talked with suggested that autopilot repair pricing is on the rise.

According to Bob Ferguson at Autopilots Central in Tulsa, Oklahoma, overhauling an older system is almost always going to be cheaper than replacing it.

"It might cost over $10,000 to overhaul an old system, but that's still going to be cheaper than replacing it with a brand new model," said Ferguson, who's worked with autopilots for over 40 years.

CHECKLIST

- Digital gyro emulators boost the performance of analog autopilots.
- Avidyne's slide-in replacement is a good option for earlier Cirrus models.
- Service parts for older autopilots are becoming difficult to source.

Autopilots Central repairs and overhauls most systems in house, including King, Century and Cessna autopilots. According to Ferguson, one of the challenges his shop faces is dealing with S-TEC models, especially flight computers and servos. That's because S-TEC doesn't supply bench-level replacement components to the dealer network. Instead, major repairs will have to be accomplished at the factory.

Bruce Grammon at Mid-Continent Instruments and Avionics in Wichita, Kansas, told us that sourcing affordable, replacement parts is becoming a challenge.

"Parts. Whether it's drive transistors for KC295 computers or servo motors for some King KFC150 systems for Mooneys, our biggest challenge is finding a healthy supply of replacement components for older systems," said Gammon. According to Gammon, autopilot repair work has increased at his shop over the past couple of years. This, he says, is a direct result of other avionics upgrades.

"Owners might spend $15,000 on a retrofit PFD system but overlook an ailing autopilot system. In many cases, owners can't handle the additional investment of a new autopilot," Gammon noted. It's easy

The Avidyne DFC90 is designed as a plug-and-play replacement for existing S-TEC 55X autopilot systems. The DFC90 can use the existing 55X mounting tray, servos and much of the wiring. It has airspeed hold and one-button straight-and-level mode.

Savvy techs might be able to perform some repairs to S-TEC autopilot actuators, top, but a faulty motor means a $1735 trip to the factory for a major-level repair. Experienced autopilot shops can usually keep old Century/Piper Autocontrol systems, middle, running. Replacement computer boards for the King KFC200 system, bottom, could cost as much as $10 grand each—and there's one for each axis.

to understand why repairing an old system seems appealing.

Factory repair comes at a premium. Cobham Avionics has three price structures for repairing the S-TEC line of autopilots. Minor level repair covers component-level diagnostics, troubleshooting and repair but without replacing major components. If major component replacement is required, the repair turns into a major level event—with a major price schedule. For instance, a 55X programmer/computer requiring a major level repair, has a flat-rate cost of $2927.

Cobham has an overhaul service—which covers replacement of most or all major components. That same 55X requiring overhaul has a price of $8441. This might be required for older computers with obsolete circuit boards. In some cases, Cobham might exchange the computer. Shops report long turn-around times, but our experience with the quality of S-TEC repairs is favorable, as is the quality of field technical support. Build time for a new system could be as long as five weeks, since each autopilot is airframe specific.

OLD STANDARDS

With old systems, it's not as easy. While the venerable King KFC200 is long out of production, field support is good but troubleshooting can be intensive. Earlier servos—including the KS270-series—are mostly obsolete, but interchangeable with newer, A-suffixed versions. Other troubles with the KFC200 could rest in the KC295 remote-mounted flight guidance computer. Problems related to the systems pitch and roll circuit boards might lead to expensive board replacement.

Still, we wouldn't trash a KFC200, as it's a good-flying and full-featured autopilot. As we report in the sidebar on page 9, digital gyro emulators and GPSS steering might offer the KFC and other analog models a new lease on life.

The KFC150 and KAP150 (the latter has no flight director) utilize a panel-mounted controller/flight guidance computer. They have automatic pitch trim and can drive altitude preselect and alerter systems.

These and all attitude-based units from Bendix/King can be prone to gyro-induced flaws. Some possible symptoms of a gyro problem include shallow wing rocking and gentle pitch porpoising. The KI256 flight director gyro could be the problem. Overhaul exchange might cost around $3600, from a reputable shop with a one-year warranty.

What about pre-KFC autopilots, including the Bendix FCS810? Our sources told us these systems are repairable, but parts are becoming scarce.

The same is said for some Cessna 200-and-300 series autopilots. Higher-end Cessna systems—including the 800-series flight control system found in heavier piston twins and turboprops—are complex. You'll want an experienced shop to handle repairs to these systems.

Early and mid-2000 model year Cessna models feature the KAP140, a rate-based autopilot with good performance and decent capabilities. There were, however, many service bulletins against these autopilots that required inspection and in some cases,replacement of servo assemblies. Look at this service record carefully when buying a used KAP140-equipped 172, 182 or 206.

If you have one of the Brittain AccuTrak or Accuflite systems, there's hope. Brittain Industries in Tulsa, Oklahoma, still offers support for some models. One system that several repair shops warned against is the Bendix M4D. This system can be found in some Beech King Airs, some bigger Cessna twins, Mitsubishi MU2s and others. Servos for these systems can run close to $9000 each, if they can be sourced.

AVIDYNE'S DROP-IN

The flagship S-TEC 55X is generally a good performer. But its rate-based turn coordinator drive isn't always well matched for speedier airframes. For example, Cirrus pilots will attest that its weaknesses are most pro-

nounced on coupled approaches, where it will often hunt left and right to keep the needles centered. GPSS steering helps, but not on an ILS, where the system might blow through the localizer. Nor does it work well on an LPV, because the 55X was conceived before the days of GPS approaches with vertical guidance. As a result, the system won't fly the vertical segment of the approach in GPSS mode. But Avidyne's DFC90 autopilot seems light years ahead, with sharper performance and useful features.

The DFC90 is partly a drop-in replacement for the 55X and it uses the same tray, wires and servos, but gets its reference directly from the PFD. This means it's an attitude-based autopilot with access to an air data computer. It also eliminates the shortcomings of a rate-based system.

Realizing that pilots might have to overcome a learning curve when stepping up from the 55X, Avidyne retained as much of the buttonology as possible from the S-TEC control head to ease the transition. The new buttons are color-coded to show what modes are active or armed.

But more advanced is the straight-and-level mode. Similar to the Level button on the G1000-based Cirrus Perspective system, pilots might get a second chance at recovering from an unusual attitude. Pushing the Level button engages the autopilot and returns the aircraft to level flight. On a demo ride in the company Skylane, we witnessed the recovery from 60 degrees of bank and 30 degrees of pitch. The system is virtually stall-proof, with pitch logic that guards against decaying airspeed.

Avidyne retained the hidden turn coordinator from the original S-TEC installation as a fault comparator. If the DFC90 sees a mismatch between the PFD attitude and the turn-rate information from the old system, it will disengage and alert the pilot.

There's also an STC that covers the DFC90 autopilot as a plug-and-play retrofit of existing 55X systems in 16 models of the Cessna 182 Skylane series, when installed with the Aspen EFD1000 PFD.

The Aspen Pro PFD provides attitude inputs to the DFC90 from its integrated ADAHRS, while displaying autopilot mode annunciations and alerts on the Aspen PFD. In addition to pitch and roll inputs, the Aspen Pro PFD also provides heading command, altitude preselect, indicated airspeed select and vertical speed command to the DFC90. The DFC90 has a starting price of $10,180 and the software unlock for integrating the DFC90 with the Aspen is $1995.

CAVEAT EMPTOR

For new retrofits, S-TEC still owns the market. The entry-level Thirty autopilot—which has altitude hold and basic nav tracking—will likely cost upwards of $17,000 after installation. We think it's a good match for light airframes and is a better long-term solution than repairing a basic older system. It also offers more features than a basic wing leveler and couples nicely with nearly any panel-mounted GPS.

When buying a used aircraft, a little research goes a long way. Any work on the autopilot should be logged in the airframe logbooks. Look for descriptive entries, including teardown reports of replacement servos and gyros. They might offer clues as to the quality of the repair.

Buying an airplane with the intentions of upgrading or repairing its old autopilot is OK, as long as you understand the costs involved.

AHARS-BOOSTING PERFORMANCE

A good way to breathe new life into an aging analog autopilot is to ditch the spinning gyro that drives it. Attitude-based autopilots rely on a horizon gyro for feeding pitch and roll output signals. These vacuum gyros—including the King KI256 flight director and ARC G550—are expensive to overhaul and add to the complexity of system maintenance. But both Garmin and Aspen have modern alternatives to sharpen the system's performance while eliminating expensive gyro upkeep.

The Garmin GAD 43 is a remote box that converts AHARS digital pitch, roll, heading and yaw rate data into analog signals used by attitude-based autopilots, to include the popular King KFC200/150 series and some ARC/Sperry autopilots. The analog signals from the GAD 43 emulate those of traditional spinning gyros. The benefit here is two-fold: First, AHARS has proven more reliable than vacuum-driven gyroscopes. Further, the digital reference output from an AHARS system is more precise and stable than an aged spinning gyro.

Aspen offers a gyroless interface with the EA100 autopilot emulator. Like the Garmin GAD43, the EA100 remote unit receives pitch and roll reference from the Aspen 1000 AHARS and sends the data to the autopilot computer, just as the old spinning gyro did.

Installing the GAD43 and EA100 digital converters isn't a slap-and-go project. There are sizable amounts of configuration and calibration to make the autopilot fly true. This means you'll want to select an installation shop that's not only experienced with installing PFD systems, but one that's also familiar with calibrating the analog autopilot it's interfaced with. This analog-to-digital transformation is only as good as the installation.

Garmin's New G3X: More Glass For Less

Garmin targets the LSA and experimental markets with an upgraded G3X. It has a new autopilot, new sensors and a lower price.

CHECKLIST

- Advanced autopilot capabilities at an eye-catching price.
- GTN and GNS navigator interface makes the system IFR-capable.
- The new G3X is finally on par with Dynon and others.

by Larry Anglisano

Team X. That's Garmin's new engineering team who's dedicated to designing products for experimental and light sport aircraft. Long-time design and support engineers at Garmin, they're also pilots and homebuilders—creating the kind of smart, cost-friendly avionics they'd want for their own aircraft.

The result of their brain power is a new line of products designed as add-ons to the existing G3X integrated glass panel. While we wonder how much growth potential really exists in the shrinking LSA and experimental markets, these new products bring impressive capability at an impressively low price point.

MATURITY MEETS VALUE

The way we see it, Garmin's original G3X could have been a brisk seller if it could overcome two obstacles. First, the system was sometimes perceived as a glorified portable GPS, since the G3X display was born from the popular GPSMAP 696 GPS navigator. This was a major misconception because the G3X system is far more than a portable. It's composed of several sub-units, called Line Replaceable Units or LRUs. This is the same technical concept used in the certified G1000. The second obstacle was the price.

The G3X faced fierce competition from products made by Dynon—a company that has a knack for bringing reliable, feature-rich, full-suite avionics—including advanced autopilot and engine monitoring interfac-

That's not a biz jet autopilot, top. It's the new G3X autopilot for LSA and experimentals. Using trickle-down technology from the G1000-integrated GFC700 flight control system, it has advanced functions, including airspeed hold, independent flight director and yaw damper. The G3X suite, left, has a redesigned and smaller ADAHRS, right, to support an angle of attack pitot tube.

The G3X fits a variety of aircraft. The three screens in the IFR-equipped Van's RV10, top, can be interfaced with Garmin GNS and GTN navigators, while a standalone, VFR version is fitting for small LSAs like the Legend Cub, middle. Garmin's new GSA28 digital autopilot servo, bottom, represents the latest in servo design. It reduces control forces while driving with a brushless DC motor.

es—to experimental and LSA cockpits at low prices. At nearly $6000—without an autopilot—the entry-level G3X was seemingly priced too high compared to the competition. Dual-screen systems had a starting price of nearly $9000.

But that was then. With a new starting price of $4395—and $5875 with an advanced autopilot—in addition to a long list of advanced features and accessories, the G3X finally plays with the big kids in the experimental and light sport avionics world at a price that's sure to catch the eye of thrifty light sport owners and kit builders.

Package pricing for the new G3X system is even more attractive if you opt for dual displays. The previous price for a dual display was $8570, but the new system, complete with autopilot, is $8000. Think of it as getting an autopilot for free. Step up to three displays and the price is $10,000, including the autopilot. That's down from $12,000.

Price aside, the G3X brings large amounts of flexibility. For example, a G3X suite can contain up to three redundant PFD/MFD configurable displays. All of the screens have a built-in WAAS GPS with a 7-inch, high-resolution WVGA display. The G3X brings primary instrumentation, providing full PFD functions. This includes an advanced ADAHRS plus integrated electronic engine instrumentation. There's also enhanced mapping— including synthetic vision, terrain and obstacle alerting, geo-referenced Garmin FliteCharts and SafeTaxi airport diagrams.

New to the G3X is the GEA24 EIS engine interface module. The module enables aircraft-specific customizing of system data input for display of engine gauges and color bands, alerts, fuel data, flap and trim position and other primary and secondary sensor data for overlay on the G3X display. Similar advanced engine interfacing is a major draw to the Dynon SkyView integrated avionics suite, and Garmin finally brings a more advanced engine display for the G3X.

The GEA24 EIS interfaces with most popular engine models, including the Rotax 912iS, although interface kits are available for other popular engines. The GEA24 module is priced at $599 and Garmin says the new unit affords flexible mounting options, plus it has standard-density connectors for a simpler interface.

Don't look for touchscreen capability on the G3X; the updated system retains traditional control buttons and knobs—snubbed by some and welcomed by others.

TRICKLE-DOWN AUTOPILOT

We think Garmin hit a home run with the GFC700 integrated autopilot system. The only rub is it's not available for aftermarket applications, since it's integrated with the G1000. But the new G3X integrated autopilot brings many of the advanced features of the GFC700, including a new smart and compact autopilot servo.

The GSA28 servo is considered smart because it contains the software drive logic and doesn't rely on a remote computer for roll and pitch commands. Weighing only 1.4 pounds, Garmin says it is more than 40 percent lighter than most autopilot servos for experimental and light sport applications. Unlike other brands, the servos are made of die-cast, machined metal components—not plastic.

Unlike traditional servos, which

LSA CLEAN SWEEP? NOT SO FAST

With Garmin jumping into the LSA and experimental markets with both feet, we figured these would be a slam-dunk and the market that Dynon now owns would soon be Garmin's.

But maybe not. We checked with three LSA manufacturers and learned that while the new-and-improved G3X look good at a distance, the manufacturers want to hear from customers and put a sharp pencil on the numbers before committing to offering the G3X and its peripherals. On the other hand, kit builders we spoke with seem enthusiastic about the system's new features—including the angle of attack and the ability to connect the G3X with a GTN navigator.

Cost is not so much the issue—although it's not a non-issue, either—but weight and complexity of installation loom large in the world of LSA. That, more than anything, explains why Garmin hasn't made serious inroads in the LSA market.

Dynon Avionics got the timing just right with its D100, D120, D180 and now SkyView systems, just as LSAs were starting to appear in volume. These have earned a loyal following in the LSA market because they're relatively easy to install and are lighter than the G3X, all up. In LSAs pushing the empty weight limits, ounces matter.

"For now, if I were setting up an airplane, I'd go with either steam gauges or the Dynon," says Darin Hart of American Legend Aircraft, one of the top-selling LSAs in the U.S. Hart told us he's installed a handful of G3Xs and found that their complexity added about 50 hours to the build time. Garmin's not unaware of this, which is why it has simplified the G3X architecture and made it easier to install for both LSA manufacturers and homebuilders.

If there's any given in the LSA market, it's that buyers, when given the choice, will opt for the most sophisticated avionics they can get, cost be damned. But that

hasn't lifted the G3X much, and it may be awhile before it does.

Randy Lervold of CubCrafters told us the same thing. The G3Xs they've installed been done as modifications post-assembly line, after the aircraft have been sold. Lervold says he's thrilled to see Garmin's new products, but he's waiting to see if there's a groundswell of interest from customers before committing the engineering resources to offer the G3X as either standard or as a factory upgrade. CubCrafter's current top-of-the-line panel includes a Dynon D180 and a Garmin GDU 370, essentially a GPSMAP 696 with an upgrade path to the G3X.

Lervold told us CubCrafters is busy enough to have engineering projects backed up, and they're not interested in taking on new work to add additional avionics options. In other words, Garmin and customers may have some selling to do.

At Flight Design, the LSA market leader, Tom Peghiny is more bullish. "I think it will definitely stimulate the market for the G3X. The initial version of it was a little difficult to install," says Peghiny. "They've dealt with that with the modular ADAHRS, and some of the other equipment they're offering is really exciting," he adds. Especially attractive is Garmin's new autopilot, with its big-airplane modular control panel with thumbwheel control of climb and pitch. Before Dynon offered its own autopilot, Flight Design had been using the TruTrak autopilot, with good results. Peghiny believes another option will resonate with LSA buyers. We agree and welcome more competition whenever possible.

—Paul Bertorelli

utilize a shear pin (enabling the pilot to break the servo free of the aircraft control surface in an emergency), the GSA28 has a gear train with an engagement clutch that back drives the brushless DC motor. The engagement clutch also decouples the motor from the flight controls when the system is off, which minimizes the control friction the pilot will feel while hand flying.

Each servo provides a built-in interface to drive an off-brand trim servo. When the autopilot is off, the servo provides speed scheduling for the manual trim commands, otherwise known as trim prompting. When the autopilot is on, the servo automatically trims the aircraft to constantly keep it in trim.

The autopilot is commanded through and annunciated on the G3X display, but with the optional $750 GMC305 autopilot control panel, pilots gain a dedicated autopilot user interface. The controller also affords additional autopilot functions—including airspeed hold, independent flight director and an optional yaw damper.

There's also a control wheel integrated into the GMC305 that is used for pitch, vertical speed and airspeed command. The system offers envelope protection, with a Level mode, to help restore the aircraft to straight-and-level flight. And because the servos interface directly with the ADAHRS, the GMC305 control panel allows for standalone operation if the display fails.

ROOM TO GROW

The new ADAHRS has a third pressure inlet for measuring angle of attack from the GAP26 pitot AOA probe. The tube is available in unheated, pilot-controllable heated or fully-regulated heated versions.

For IFR applications, the new $425 GAD29 ARINC databus adapter enables G3X connectivity with GTN and GNS navigators. This opens up the G3X to a broad mission profile.

How about ADS-B? The G3X can be so equipped with the GDL39R—a remote version of the portable GDL39 ADS-B receiver.

Garmin's Team X might not conquer the market with the new G3X, but they've added enough functionality to finally make it a major player for LSA and experimentals.

Range Extenders: Going the Distance

If you use your airplane to travel, chances are there's a mod to add aux tanks that add capability at surprisingly competitive prices.

by Rick Durden

CHECKLIST

- Aux tanks can increase safety by decreasing landings for fuel.
- Extra fuel capacity may allow tanking cheaper fuel.
- Some installations allow gross weight increases of as much as 400 pounds.

Being able to make a trip nonstop is more than just convenience—it can be a safety of flight issue as the risk of an accident is highest during takeoff and landing. The reality is that most flights of four- and six-place airplanes are conducted with only one or two of the seats occupied and at something below gross weight. For many owners, that means that some sort of auxiliary fuel tanks can give their airplanes more range and potentially increase safety.

We surveyed the six major companies that provide aux fuel tanks and found that they weren't as expensive as we expected, and there are some that can tack on at least two hours of fuel for a large proportion of the general aviation fleet. While every mod involves tradeoffs, the penalties in terms of drag and weight seem to be minor and the benefits—including, in some cases, gross weight increases—can be quite nice.

MIKE JONES AIRCRAFT

The venerable mod shop, Colemill, which hot-rodded a lot of GA airplanes over the years, went under, pun intended, following a tradition established by Aeronca and the Piper Comanche—the shop was devastated by a flood. The fiscal aftermath was not pretty. Fortunately, Mike Jones, in Murfreesboro, TN, purchased the STCs and what was left of the jigs and tooling and is carrying on with the mods, including a combination tip tank and winglet for most of the Beech Baron series. The tank/winglet carries 15 gallons of fuel a side, has a separate filler cap and uses a transfer pump to move the fuel into the main tank. Besides adding a total of 30 extra gallons, the airplane gets the performance benefits of winglets, although no numbers are provided for the claimed increased rate of climb, faster cruise speed and improved single-engine capability.

The mod is approved for virtually all Barons and is priced at $29,900 for a pair, installed.

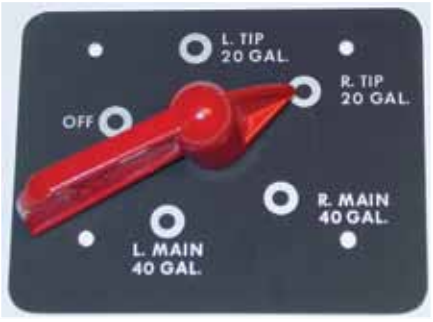
D'SHANNON AVIATION

For years D'Shannon has specialized in mods for Beech Bonanzas, notably tip tanks. It currently offers a 20-gallon tip tank—all usable—made of composite material. It weighs 34.2 pounds installed. Fuel is transferred to the main tank on the same side as the tip. Quantity is monitored by either a gauge on the panel or a sight strip in the side of the tank that allows the pilot to see the fuel in the tank.

If the airplane has a magnetometer in the wing tip, it can be placed in a pocket in the tip tank, avoiding the need to relocate the magnetometer. The tanks include LED navigation lights and are wired for LED strobes. There is a lifetime warranty on the tanks.

As with any tip tank, installation provides an "end plate" effect that provides aerodynamic benefits, although no performance improvement numbers are provided. One of the other benefits is an increased gross weight from 150 to 300 pounds for most installations. It can go up by as much as 400 pounds for some IO-550-equipped Bonanzas. The weight increase can be carried in

D'Shannon tip tank installation on a Bonanza.



Flint aux tanks, top, internal, far left, and three tip tanks. Osborne fuel selector with main and tip positions, below left.

the tanks themselves or in the cabin.

The tanks are shipped primed, ready for paint. Price is about $12,000—it varies slightly with the specialized needs of the airplane. Installation usually runs something over $3000 but less than $4000. They can be installed on all models of the Bonanza except the B36TC. The gross weight increase applies to all models except the straight 35.

D'Shannon told us it is about to release a carbon fiber combination wing tip extension and 15-gallon tip tank that will increase the wing area and span of a Bonanza to that of a B36TC Bonanza. It will include flush antennas and lights.

J. L. OSBORNE

Aluminum tip tanks have been built by J. L. Osborne for over 50 years and are now available for virtually all models of the Bonanza, most models of the Navion and the Piper Comanche line, single and twin. Tank capacities—all usable—for the Bonanza and Navion are 20 gallons; for the Comanche, it's 15 gallons. Weights range from 19-27 pounds.

Depending on the installation, the fuel is either transferred to the corresponding wing's main tank via a transfer pump or gravity feeds to the fuel selector, which is changed as needed to reflect the number of tanks directly accessible. Some single-engine installations allow for feeding the engine from both tip tanks at the same time, something we like, as dealing with an imbalance can range from a minor irritation to a significant distraction.

The installation allows for a gross weight increase for most airplanes. It varies from 50 to 200 pounds, however, for Bonanzas with at least 300-HP engines and the Osborne tip tanks, gross weight can be increased by a whopping 424 pounds to 4024 pounds, the highest in the industry.

Price ranges from $6000 to $12,000 depending on the model airplane and installation kit. Installation time runs between 30 and 50 hours.

O & N AIRCRAFT

Creators of the Silver Eagle turbine conversion of the Cessna P210, O & N Aircraft has long been making auxiliary fuel tanks, primarily for Cessnas, that go in the aft baggage area. With a separate, flush filler, they use a transfer pump to move fuel to the right main fuel tank. The gauge for the aux tank is placed near the fuel selector, and a light illuminates when the transfer pump is activated. It shuts off automatically.

The tanks vary in size from 14.6-gallons for the Cessna 150/152 through a 29-gallon tank for the 210. Most raise the floor of the baggage compartment some distance. The allowable weight for the baggage area must take into consideration the weight of the fuel being carried in the tank. The aluminum tanks are surprisingly light; the heaviest is only 22 pounds. Prices range from $2450 for the Cessna 150/152 through $4800 for the P210. Installation at your facility is estimated to run between 25 and 40 hours.

While we have long been nervous about carrying fuel in the fuselage, we have looked for but have never seen any data that baggage compartment fuel tanks increase the risk of post-crash fire.

O & N also makes a baggage compartment tank for the Grumman-American Traveler, Cheetah and Tiger—AA-5, -5A and -5B. Holding 18 gallons, it is a tank-within-a-tank aluminum box that rests on the right side of the baggage area, behind the rear seat and feeds the right main fuel tank. Price is $4350, installation is estimated at 25 hours.

An 18.5-gallon, wing locker tank is offered for several of the 300- and 400-series Cessna twins, and up to four may be installed in an airplane. They are aluminum and sell for $4200.

Finally, O & N also provides aux nacelle tanks for the Piper Navajo (26 gallons, $12,500), Chieftain (27 gallons, $12,500) and Seneca (18.5 gallons, $4200) as well as $8000, 64-gallon replacement bladder tanks

CONTACTS

Mike Jones Aircraft
615-896-5678
www.mikejonesaircraft.com

D'Shannon Aviation
800-291-7616
www.d-shannon-aviation.com

J. L. Osborne
800-963-8477
www.jlosborne.com

O & N Aircraft
570-945-3769
www.onaircraft.com

Met-Co Aire
800-814-2697
www.metcoaire.com

Flint Aero, Inc.
619-448-1551
www.flintaero.com

for Mooneys that match the original capacity of the M20F and J and increase the capacity of the M20C, D, E and G by 10 gallons.

MET-CO-AIRE

Making fiberglass tip tanks incorporated into new, Hoerner wing tips for the Piper Apache and Aztec, Met-Co-Aire designed the 24-gallon tanks to be user-friendly. Each has a check valve where it plumbs into the fuel line for its respective main tank, effectively adding 24 gallons of fuel to each wing without having to mess with a change to the fuel selector or installing a transfer pump. Each tank has its own filler and quick drain. There is no separate fuel gauging system—a placard is attached to the existing gauge to indicate the increased fuel capacity.

A pair adds 25 pounds to the empty weight of the airplane and costs $9500. Installation time is estimated at 25 hours.

FLINT AERO, INC.

Flint Aero has been making aux tanks for the wings of high-wing Cessnas for over 30 years. Other than the 150/152 and pre-shutdown 172 line, if you own a high-wing Cessna, the chances are that there is a Flint tank for it.

The tanks are either internal—slid into the existing wing from the end—or tip tanks that add span to the wing. Many of the tip tanks allow a gross weight increase, although some require some of that weight to be fuel in the tip tanks and on some installations the landing weight does not increase. All have their own filler and drain and use transfer pumps to move fuel to the main tank.

The internal tanks are for the 172R, S, 182S, T and T182T. Each holds 11.5 gallons, usable. Gauges are provided. Cost is $6000 for a pair for the 172 and $6443 for the 182. Installation time is estimated at 45-60 hours.

The tip tanks add from 36 to 52 inches to the wing, depending on the airplane. Most allow a gross weight increase, which ranges from 200 pounds to as much as 400 pounds on the Cessna 185—although for some installations, there must be a minimum quantity of fuel in the tip tanks to take advantage of the gross weight increase. The tanks range in usable capacity from 13.5 gallons a side to 19.3 gallons. Prices range from $8800 for the Cessna 206F and G to $10,145 for the 337 Skymaster. Installation estimates are 45-60 hours for all but the 185, which is 75-90 hours.

CONCLUSION

We like the peace of mind having extra fuel on board buys us when the weather goes down or we want to make a trip nonstop. Having full aux tanks the time when you have to divert 200 miles because of widespread, unforecast fog may well pay the price of admission for those tanks.

On the hard reality side, while you won't recover the full cost of the tanks and installation, you will up the resale value of the airplane, and you'll enjoy the savings of fewer stops and the ability to tanker less expensive fuel while you own the machine.

The True Limiting Factor on Range

For most of us, the range of our non-potty-equipped airplanes is not limited by the ability to carry fuel; it's set by the distance between bathroom breaks. As many pilots, and their passengers, claim to be charter members of the TWBC (Teeny-Weeny Bladder Club), we decided that an article on range extension had to look at the real world of flying a very long time without stopping.

Therefore, we looked at what's on the market for human liquid waste management in little airplanes. Having made do in long-legged airplanes with a pickle jar and paper towels early in our aviation careers, we later came to appreciate what was commercially-available. And, we'll say it up front, no, we haven't found a way to use any such product when flying other than solo without a certain amount of embarrassment or at least commentary within the cabin.

The Little John has been around as long as we've been perusing aviation product catalogs. Consisting of a plastic container and a screw-on lid, it holds 32 ounces of fluid. After use in flight, one simply pours out the contents in an appropriate location and cleans the container. It's bright red, so the chances of confusing it for something else are fairly low. We've seen prices as low as $7.95 at Aircraft Spruce. The disadvantage is that it is designed for males—there is an adapter for females priced at $6.95.

The Travel John, sometimes referred as a piddle-pac, makes use of disposable diaper technology to trap urine and turn it into a gel so that it can't spill. Post use, it is simply a matter of closing it up and then throwing it away after landing. It is unisex. The only warning we have is to not wait overly long prior to use as their capacity is finite. Available from a large number of suppliers, including Aeromedix and Amazon, we have found them priced at $6.50 for a pack of three. The unit price goes down when purchased in bulk.

The most complex of the generally available devices is the one-quart capacity unit, appropriately named, GoPilot. Priced at $25.95 through Sporty's and equipped with an accordion-style hose arrangement that we wouldn't want to have to try to clean, it includes a storage bag and hand sanitizer.

From a practical standpoint, we recommend buying Travel Johns in quantity and always keeping some in your flight bag and car—they are easy to use, don't spill and when you need one, you'll be glad you had the foresight.

Recurrent Training: Bang for the Buck

Plan on a minimum of $1000 for insurance-approved recurrent training. The best programs provide a combination of simulator and in-airplane training.

by Rick Durden

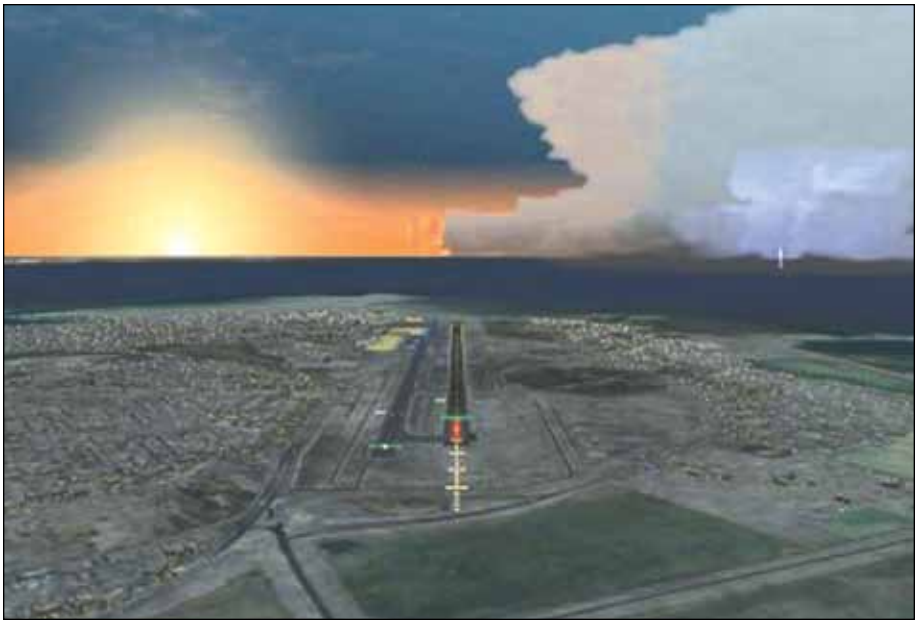
If you are flying a high-performance single, piston twin or turboprop, particularly if you use it for business trips, there is an increasing probability that you will get a notice from your insurer or employer requiring that you take annual recurrent training.

We did a survey of organizations that specialize in recurrent training and found that there are programs that satisfy insurance carrier demands that range from one to three days in length, are either simulator or airplane based, and range in price from as low as $500 for a piston single, to north of $2400 for turboprops.

Once you get past the "They can't do that to me!" reaction, you are faced with the questions of how to go about complying, how much it's going to cost and how much time it will take.

Step one is to find out precisely what sort of training will be satisfactory to your insurer. At the most basic level, annually going through a flight review (FR) and Instrument Proficiency Check (IPC) with an instructor you trust to give you a good workout may satisfy your insurer or even give you a slight break on the premium.

That may not be enough once you get more advanced than a piston single or if you are getting up in years. You may even be told that you have to go to a specific training provider. Before taking that as the last word, especially if it is coming from the accounting department at your employer, speak with your or your employer's insurance broker. Insurers have lists of training organizations they approve for recurrent training and may be willing to look at the program you like and approve it.



An evening thunderstorm in the simulator at SIMCOM.

CHECKLIST

- ⊕ A good program will offer an IPC and flight review on completion.
- ⊕ Some programs offer a combination of simulator and time in your airplane.
- ⊖ For the extra prices charged, a motion-based simulator is not worth it.

SIMULATOR VS AIRPLANE

Some training providers specialize in pure simulator recurrent training, some use a simulator and your airplane and some are airplane-only trainers. Naturally, each advertises its method as the best.

The simulator versus airplane debate was settled long ago, simulators won. Put simply, you don't have to waste time positioning for multiple approaches and you can more realistically practice emergencies than you can in the airplane. After all, simulator development was pushed hard after a number of fatal airline training accidents in which simulated emergencies became real.

Some training organizations use generic simulators that do not precisely match the airplane type the client owns. We do not think that is a handicap because flying is flying; the thinking and planning for an approach or how to handle an emergency is general enough that a differences briefing and discussion can flesh out the specific details for the type of airplane. Further, many operations do simulator training and then spend time in the owner's airplane, putting polish on performance and system specifics, a good combination, in our opinion.

We want to be clear that we feel recurrent training in the airplane is absolutely acceptable—we are just of the opinion that if the option exists to do training in a simulator versus

Frasca sims at Century Air, Cirrus, top, and Bonanza, middle. Recurrent Training Center's facility, Champaign, IL, bottom.

only in the airplane, the simulator option is better.

MOTION?

There's a fair amount of hype given to motion-based simulators—something we feel is just that, hype. There have been some involved studies on the issue, particularly one titled "Training Effectiveness of Whole Body Flight Simulator Motion: A Comprehensive Meta-Analysis," published in the *International Journal of Aviation Psychology* in 2012 that included a compendium of data from previous research. The study concluded that there was "no evidence that simulator motion improves flight performance in real aircraft." We agree. We have trained in all sorts and levels of simulators and see no benefit of motion simulators over non-motion ones. However, the simulator should be at least a Flight Training Device that meets FAR Part 61.57(c)(2) requirements for instrument flight training, instrument currency and use for an IPC for a pilot who also meets the requirements.

RESULT?

We are of the opinion that a pilot who spends the money and time to get serious recurrent training and meets the measurable performance requirements of the training organization (which should be specified going in) should come out of the program with a signed-off IPC (or be IFR current), flight review (FR) and certificate of completion for the insurance company.

With the above background, we surveyed some better-known recurrent training facilities that are accepted by various insurance companies for recurrent training.

RTC

Based adjacent to the Champaign, IL, airport, Recurrent Training Center (RTC) has been providing simulator training since 1988. It targets pilots flying piston singles, twins and the King Air 90, 100 and 200 series. RTC advertising puts it plainly, "Pilot proficiency at the best price. Period." It has Level 3 and Level 6 Flight Training Devices, so a pilot can obtain an IPC via the simulators if he or she has been IFR current in the past 12 months. It also has the only Skymaster simulator in the world.

The single-engine recurrent course provides eight hours of simulator time and eight hours of classroom time in two days. For multi-engine recurrent, the course expands to two-and-a-half days, which adds two more hours of simulator and classroom time.

Because RTC has FAR Part 142 approval, upon request, the client can spend one hour in a Level 6 simulator and comply with the requirements for a flight review. There is no extra charge.

Cost for the single-engine course

Timing an Issue? Training that Travels

For many who have the wherewithal to own a high-performance single or twin the cost of recurrent training is not nearly as significant as the time required. A two-day recurrent session at a sim center often means at least a lost day on either side getting there and getting home. For that reason, there are recurrent training specialists who bring the program to you.

Markette and Associates, Inc., was formed by Robert Markette, a 14,000-hour professional pilot, to do initial and recurrent training. Its instructors, including Markette, travel to the client to conduct piston twin and turboprop recurrent in the client's airplane. Markette knows the value of simulators—he uses one in his Sabreliner training program—but has set up his company as a convenient and "competent alternative to simulator training" for recurrent work.

The typical client contacts Markette, schedules training at a location of the client's choosing, and the instructor does the traveling. Prior to the scheduled session, the client receives a training manual and syllabus dedicated for the type of airplane involved and is expected to review it. Ground training takes place where the client desires. Flight training is given in the client's airplane.

Markette's training program is based on a Part 135 captain recurrent training syllabus with ATP performance standards. No minimum or maximum time is specified—training is to proficiency, Markette said that the average for his clients is two days. Cost for a piston twin is $1500 plus the instructor's expenses; for a turboprop it's $1900.

You can reach them at 800-947-1617 and www.markketeandassociates.com.

San Diego-based Aviation Training Management targets piston singles and twins and has a number of dedicated instructors who live in various areas of the country. An instructor is assigned to a client based on either the client's preference or the geographic proximity of an instructor with expertise in the type of airplane.

The training syllabus targets 16 hours, including up to five hours in the airplane. ATM's Carl Garvey advised us that for their clients, time is what matters—a two-day recurrent session would often mean losing a week of productive work if he or she traveled to a training center. ATM sends training materials to the client, who reviews them ahead of time. The ATM instructor then works with the client at the location the client selects. Cost is $1600 plus the instructor's expenses.

Contact ATM at 772-778-7815 or www.flyatm.com

starts at $889 for a "generic IFR recurrent." For airplane-specific recurrent training, prices range from $1000 for Cessna singles, through $1600 for the Cirrus series. Piston twin recurrent training costs range from the generic multi-engine, two-day IFR recurrent at $1199 to aircraft-specific courses that vary from $1200 for the Twin Comanche through $1800 for the upper-end twin Cessnas—340 through 421. The two-and-a-half day King Air recurrent is $2400. There is only one glass cockpit simulator in RTC's arsenal, an Avidyne for the Cirrus. We were advised by RTC that there has not been enough demand for glass cockpit recurrent training to warrant acquiring more such simulators.

SIMCOM

With a training center in Dallas, TX, Scottsdale and Glendale, AZ, and two in Orlando, FL, SIMCOM has become the big dog of recurrent training for the piston single or twin pilot seeking insurance-approved recurrent training.

SIMCOM offers three-day simulator-based courses for most piston twins as well as the Piper Malibu series and the Saratoga and 6X. The syllabus includes six hours in the left seat of the sim, nine hours in class and three hours of briefing/debriefing associated with the sim time. The simulators are advertised as "visual-

continued on page 32

CONTACTS

Recurrent Training Center (RTC)
800-727-1014
www.rtcpilot.com

SIMCOM
800-238-4468
www.simulator.com

Flight Level Aviation
724-880-2948
www.flyimc.com

Century Air
973-575-4800
www.centuryair.com

Insurance for Seniors: 70 is the New 65

The insurance market for older pilots isn't as grim as it once was. Stick with the same company, fly often and get recurrent training.

by Jonathan Doolittle

CHECKLIST

- Insurance companies look favorably at customer loyalty.
- Insurers still offer coverage to pilots aged 80 years and older.
- Eventually, insurers won't offer the liability limits you once had.

The insurance market cycle has come a full 180 degrees from where it was in 2003, from very hard to very soft. The number of insurers competing for every GA insurance dollar has never been higher. As a result, rates are historically low. Underwriting guidelines are more relaxed than they have been in years.

On the other hand, aircraft insurance becomes more expensive and less available as pilots get older. But what exactly is the magical age that raises red flags in an insurance underwriters computer? The short answer: It depends on what you fly and the relationship you have with your carrier.

SENIORITIS

For underwriters, the fundamental question when deciding whether or not to sell insurance to someone—and how much to charge—is the suitability of the pilot-to-airplane combination. This is true of pilots of all ages, of course.

Given a universe in which airplanes, engines and other systems are quite reliable, and nearly 80 percent of accidents involve pilot error, the main issue for insurers is the pilot's experience, training, attitude and proficiency. In other words, how likely he or she is to have an accident.

Just when does age become a factor? There are a number of studies that have looked at airline and GA pilots, and their conclusions about when pilots start to lose their edge vary, but they all agree on one thing: At some point, if he lives long enough, there is a noticeable decline in a pilot's ability to guide an airplane accurately through space and return it safely to the earth.

Age causes decreased ability across a broad front, affecting everything from sleep loss, sight, hearing, short-term memory, motor skills, problem solving, division of attention, monitoring skills and a range of other cognitive functions. These losses of function happen at different times in different people. Some of these losses are attenuated by pilot experience, some are not.

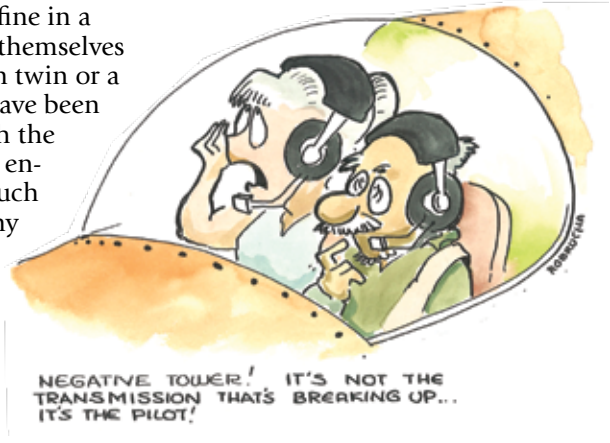
Among academics and regulators concerned with aging pilots, there is discussion of using "functional age" as determined by testing in place of chronological age, but there is no agreement on what is an acceptable level of pilot performance, nor a reliable way to measure this level. One need only look at the history of the age 60 rule in airlines to see how difficult and sensitive the issue of pilot age is.

Still, insurance underwriters know what you and I know: Some folks are fine flying at 75, and others should quit at 65. Some folks are fine in a fixed-gear single, but find themselves lost in a pressurized piston twin or a jet. And some folks who have been flying instruments through the dark and the clag for their entire flying lives are now much more comfortable on sunny days. At some point, age will diminish every pilot's ability to act as a pilot. For some, the symptoms are obvious. Sometimes it's easy to spot these pilots on the radio frequency but for others, the symptoms of declining skills are far more subtle.

THE MAGIC NUMBER

We last looked at the issue of aging pilots 10 years ago, and some things have changed while others have not. The entire question of aging pilots remains extremely sensitive, and although we spoke to representatives of most of the major GA insurers, not one wished to be quoted or named. But all were willing to talk to us, and most seemed quite open about how they approached the issue of older pilots.

One change that has taken place over the last 10 years is the continued automation of the quoting process for light airplanes among the insurance companies that work through brokers. Ten years ago, there were three insurers that had quoting websites; now there are 11, with only two or three left where the quoting process is completely manual. For brokers, this means that there is less open communication with underwriters. Brokers who want to explain the special circumstances of their



OLD JET JOCK? COMMIT TO SAFETY

Light and Very Light Jets have not taken over the airways in quite the way that some predicted, but there are more GA pilots flying their own turbine airplanes than ever before. You might think that given the cost and complexity of these airplanes, insurers would run screaming away from them as soon as their owners started to get up in age. But the insurance industry looks at turbine airplanes somewhat differently from piston airplanes.

In part, insurers of owner-flown turbo-props and jets require more of the pilots of these airplanes. Annual recurrent training is pretty much a requirement—often in a simulator. It is quite rare to find the pilot of a turbine aircraft who does not have an instrument rating, and pilots of jets have had to pass a type rating ride in order to get into the left seat. Reinsurance of these airplanes (protection that insurance companies buy to lay off part of the risk they take) is often handled differently. The result is that GA turbine pilots are usually able to get much higher limits of liability than their counterparts flying piston airplanes.

Several carriers will offer $10,000,000 of liability coverage for single-pilot, owner-flown jets, and in some cases more. For this reason, turbine pilots tend to be able to hang on to more liability coverage as they get older. Because the premium and liability limits associated with most turbine policies are higher, the underwriting process for owner-flown turbines is much less automated, enabling brokers and underwriters to discuss the specifics of each pilot's situation, as well as ways that he or she can improve it.

Insurers of turbine airplanes are still very concerned about aging pilots, and they may very likely offer you the choice between the limit of liability you have now and the ability to fly single pilot at some point.

If you own a turbine, try to stand out in your underwriter's mind as someone he should want to insure. Several underwriters told us that they appreciated it very much when a client proactively did training that had not been required by the company, or took other steps that showed his or her commitment to safety. Some promote taking a second pilot along on a long trip or in bad weather.

One insurance underwriter told of a client who operated a Cessna Citation who had written his own operations manual, updated it annually and submitted it to his broker and his company. This shows a commitment to safety.

"That is the kind of insured that I am looking for," he said. "The pilot who does something extra to keep safe is the pilot that I can sometimes do a little extra for in return, and not get in trouble if something does happen."

client have to work harder to make contact with an underwriter than they did 10 years ago.

The majority of underwriters said that they started to look at the issue of aging when pilots turned 70. Two said that in more complex airplanes, they started taking a closer look at 65. Most carriers seemed to look carefully at their own loss statistics, and most said they saw a slight uptick in accident rates among their older pilot clients. For the most part, this is five years later than it was 10 years ago, when 65 seemed to be the magic number. We think in part this is due to the soft market, but we think it is mainly due to the fact that the average age of pilots is continuing to increase.

Just how underwriters approached their clients who were 70 or older depended upon a number of factors, mostly related to the relationship with a specific client, or how much risk they felt they were taking. Interestingly, the very first variable looked at by insurers was whether a specific pilot was already a client, and how long he or she had been with them. Current customers of long standing got the most favorable treatment. One underwriter summed it up this way: "Somebody comes to us at age 70, there is no money in the bank. And how long are we going to get to keep him as a customer? We're looking for people that will be with us a while."

The complexity and cost of the insured aircraft was the next issue of concern on the minds of most insurers. "We start to get a little pucker factor when guys reach 70. We get more pucker when the guy is flying a Cessna 421 worth $500,000 than we do when he is flying a $50,000 Skyhawk," was the way one insurer put it.

In the words of another, "Face it, bigger airplane, higher speeds, more seats, longer checklists and higher repair costs. If we have an older pilot who is slowing down a little bit, those are the airplanes we worry about first."

WHAT SCARES THEM

The limit of liability carried is another worry for underwriters. Underwriters said they gave more scrutiny to pilots who carried higher limits of liability, especially those who carried so-called 'smooth' limits, that is, coverage without sublimits for bodily injury.

Most companies said that they would reduce the amount of liability they offered to their customers somewhere on the north side of 70 years of age. One carrier said that he looked hard at his customers in complex airplanes once they reach age 65.

When an underwriter looks at an application form from an older pilot, he is looking for whatever signs that he can find that will paint a picture of this pilot for him. Is this 70-year-old pilot still near the top of his game, or should he hang it up? The underwriter does not have much to go on. As one underwriting

officer put it, "Given the price of the product, its not like we get to meet each of these guys, never mind fly with them. We're working with very little data. But the older pilot who is flying steadily, 100 or 150 hours a year, he is much more likely to be current and proficient, than the pilot who is only flying 10 hours a year. In a complex airplane, the 10-hour guy scares us."

Claims history is another red flag for underwriters looking at older pilots. As one underwriter put it, "It's not sudden incapacitation so much—those accidents are spectacular, but don't happen all that often. The types of claims that we see that make us wonder about a pilot losing his edge are typically smaller in size. It may be a guy who starts an engine with the tow bar still attached to the nosewheel, or during his run-up, rolls into the airplane ahead of him or maybe he lands with the wheels up. It's those kinds of things that raises eyebrows."

And this observation points to the most frustrating part of the older pilot issue: It is often difficult to distinguish between a stupid pilot trick that could happen to a pilot of any age and an accident that results from the ravages of Father Time.

To further muddle the picture, there is also considerable evidence in the academic literature that older pilots do make use of their superior flying experience to avoid having to demonstrate their superior flying skill, and avoid accidents that happen to their younger counterparts.

KEEP EM' FLYING

Overall flying experience and background is also a consideration. Underwriters are likely to give a 25,000-hour airline pilot with 2000 hours in his own airplane more leeway than a 500-hour private pilot as they both get up in age.

Pilots who carry higher limits are more likely to be required to submit to an annual FAA medical and EKG. One underwriter told us that he viewed compliance with his company's annual medical requirement as an important indicator of the pilot's attitude. He views the willingness to submit to an annual medical as a sign of that pilot's willingness to go above and beyond.

In addition to the amount of flying, underwriters look favorably upon pilots who get training each year. In most pressurized or turbine airplanes, recurrent training will probably be required. The FAA WINGS program has fairly wide acceptance. Additional ratings or certificates are also looked upon favorably by insurers. Pilots who are flying only a minimal amount each year in a twin or retractable may be asked by their insurers to take a flight review or instrument proficiency check to brush their skills up, and as evidence that they haven't forgotten how to fly.

When Father Time shows up, insurance issues might mean it's time to park the complex and high-performance machine in favor of something simpler—perhaps a light sport. Still, no matter your health or flying skills, insurance underwriters worry about your age. Impress them with additional training.

STAYING INSURED

If you are part of the growing wave of older pilots, or you are approaching the threshold, there are a number of steps that you can take in order to get more insurance for less money for a longer time. We recommend that you have a chat with your insurance provider. Find out how long you can plan to keep your current coverage if you stay with your current carrier. Will anyone else let you have your limit longer? Get your broker's best guess of pricing stability as well. Discuss your plans for any aircraft upgrades that you are considering, and any specific concerns that you have going forward.

Stay the course. Find a good insurer when you are somewhere between 60 and 65, if not sooner, and stay with them. This is sometimes easier said than done, given that insurers from time to time have changes in appetite, but some companies are more likely to be stable than others.

Insurers are looking for a long-term relationship, because they are in this to make a buck. If you change insurers every year to save a little money, don't be surprised if nobody is terribly interested in taking you on as a new customer on your 70th birthday.

If you have done your homework, you probably never need to fly without insurance, no matter how long you continue. Every underwriter we spoke with had clients who were still flying in their 80s, and two had clients that they knew of who were flying in their 90s. But there will probably come a day when your insurance company won't offer you the limit of liability that you had in the past, or may not insure you to fly your turboprop by yourself. You may be able to postpone it, or make it cost less along the way, but realize that it will happen if you keep flying long enough. When it happens, you have a decision to make.

Last, be realistic. You may find one day that you are no longer comfortable flying to ILS Cat I minimums, or flying at night, flying in poor weather, or flying by yourself. There is a reason that airline pilots retire at age 65. If you are 70 and flying a jet by yourself, give that some thought. Be realistic. As one insurer said, "When you slow down, get a slower airplane."

Garmin Pilot App: Dynamic Mapping

Garmin's updated Pilot app 5.0 has better navigation maps and smart features that mimic an advanced GPS navigator.

by Larry Anglisano

Any pilot who's operated a Garmin aviation portable GPS will be familiar with dynamic navigation maps. Now, Garmin brings the familiar dynamic mapping to the latest version of the Pilot app.

With dynamic mapping, the user can customize the look of navigation and base maps and choose between track-up or north-up moving map orientation. With traditional static maps, the on-screen labels appear in a fixed position and orientation. So when the map is rotated, the labels may appear sideways or upside down. It's a lot like viewing a paper map sideways or upside down. When in track-up mode, however, navigation maps on Garmin Pilot will dynamically adjust to the direction of flight—automatically turning the maps so the labels are upright.

When zooming into an airport, Garmin's SafeTaxi airport diagrams automatically appear on the moving map without the need to switch to a dedicated airport diagram page.

The maps on the updated app are highly configurable, resulting in a higher level of customization, compared to the older version. You can change the map color, visibility range and alter the label sizes for airports and navaids.

Compared to the older version of the Pilot app (which we covered in-depth in the April 2012 issue of *Aviation Consumer*), version 5.0 improves the speed of map redraws. We used the updated app on a trip from New England to southern Florida—frequently changing from high altitude IFR to VFR charts—and enjoyed lightning-fast map refreshes.

The app has a home function, which calls up a big-icon menu structure that looks similar to the menu structure on Garmin aera-series portable or panel-mount GTN navigators.

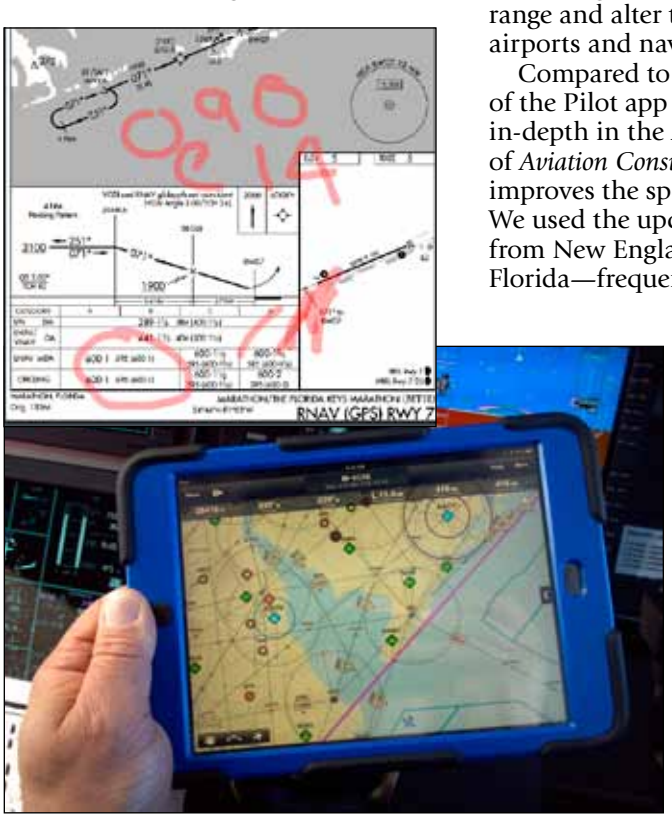


Chart annotation, top, lets you draw on Garmin's Flite Charts. New dynamic maps have faster map rendering, tighter zooming and consistent map resolution, bottom.

NOTING THE CHART

A new chart annotation feature allows the user to highlight or make notes on approach charts. It's like using a classic Etch A Sketch—just finger the chart to draw attention to minimums, fixes or scribble wind and ATIS information—for example.

Any notes you scribble on the chart (or on the airport facility directory) remain there until the next chart cycle or until you clear the annotation. Annotation might work better with a stylus—especially on a iPad mini or iPhone—and if you have fat fingers, but we think most pilots can make it work.

Garmin Pilot 5.0 makes use of cloud-based information storage. All trips, aircraft, bookmarked flight plans, pilot details and user waypoints are automatically saved to the Garmin cloud and tied to the pilot's username, so pilots with two Garmin-enabled devices—like a tablet and a smart phone—can log in and access their information from each one.

Garmin says the latest update of Pilot—and all future updates—incorporates customer-requested features and improvements. This type of forward thinking was a big part of Garmin's success in the portable GPS market. The latest version is available as a free update for existing iOS Garmin Pilot subscribers. New customers can try the app free for 30 days. After that, it's $9.99 per month or $74.99 annually. Garmin is planning a similar update to Pilot for Android applications in the coming year.

We think the new Garmin Pilot version 5.0 steps the user interface up several notches from the original Pilot MyCast, while retaining the intuitive feature set we liked in the original version.

We can't help but wonder if apps with this level of advanced mapping and reasonable subscription costs will kill the aviation portable GPS forever, even if the cockpit tablet it plays on is less than perfect.

Oil Filter Rejoinder: Champion Takes Issue

We recently picked Tempest as our choice for oil filters, but Champion disagreed. They said we overlooked some important features and told us why.

Champion has taken exception to our report comparing oil filters in the March 2013 issue and we're giving the company space this month to offer a rejoinder. Recall that our article in the March issue concludes that we would have no problems installing either the Champion or the Tempest filters in any engine, but we think because it's $5 cheaper, the Tempest is the better value.

Although Champion argues that the technical features of its filter give it the edge, we remain unconvinced and we're standing by our conclusion in the March article. Four years ago, in a three-way analysis that included the now-defunct Kelly Aerospace oil filger, we gave Champion the nod. But in reviewing the filters again and on second consideration, we prefer Tempest's magnet and bypass valve design. Obviously, Champion disagrees and their viewpoint follows.

CHAMPION'S REPLY

In 2009, *Aviation Consumer* ran an article similar to the one in the March 2013 issue, comparing the same filters from the same manufacturers. Although nothing has changed in either filter, *Aviation Consumer* recommended the our filter as a better-built product in the first article and Tempest in the second.

The 2009 article noted that the Champion filter had a larger, two-piece internal gasket of materials with different densities, more filtration media, a coil spring to keep the media mated to the base and a substantial, separate bypass valve, all of which justified the 25 percent higher price and made it a better product.

We introduced the first spin-on aviation oil filter in 1974. Our original design was similar to the current Tempest design, thus garnering the phrase on the current Tempest filter: "The Original." In 2002, based on decades of experience, Champion improved the "original" design with the introduction of the "-1" part numbers. We now use a coil spring to hold the media in place—versus the old leaf spring currently used in the less expensive Tempest filters.

COIL SPRING

During our field and laboratory testing, the outdated leaf spring design was proven to be susceptible to deformation during cold starts, allowing dirty unfiltered oil to continually circulate back into the engine until the filter is replaced. The coil spring costs more to manufacture, but we are convinced that the increased cost is well worth the added protection it provides to your engine. Our coil spring advantage was noted in both our 2009 and 2013 articles.

While the Tempest filter claims to utilize a spring retention cup to keep the Tempest spring from coming loose and entering the engine, Champion's filter bypass valves are designed, manufactured, assembled and tested to tight aerospace tolerances to ensure their springs don't come loose; thus, they don't require a retaining device like the Tempest filters. This improved Champion design decreases weight and allows for an unobstructed flow of oil around the spring. Our observation was based on Tempest's claim that the containment cup is an added safety feature.

The author of the *Aviation Consumer* review stated that he was nearly sold on the ring magnet concept from Tempest, and he asked us at Champion why we didn't include a ring magnet in our filter. We provided *Aviation Consumer* with intricate flow diagrams that simulate how small particles retained by the magnet can be blown off the magnet and back into your engine when the filter goes into bypass mode. We understand that the diagrams were not published due to space constraints, but the article did mention our position on the lack of effectiveness the magnet provides. As only ferrous metals would be caught by the magnet, we pointed out that inspecting the filter media for any type of metal is a much more effective means to identify problems within your engine.

We disagree with the comment in the article that while the Champion filters have eight inlet holes versus the four on Tempest filters, it is unlikely they make a sizable difference in performance. Although the additional inlet holes in the Champion filters cost more to manufacture, they more evenly distribute the oil across the filtering media, allowing for more efficient filtration and less possibility of a restriction in the media.

Champion reiterates that we are committed to providing the best filter possible to protect your engine from potential damage. For this reason, we have chosen to manufacture a filter that costs a couple bucks more to ensure that you are flying with the most effective and safest filter available.

Globe/Temco Swift

A much-modified retract with quick handling and a loyal following—it demands respect on the ground.

The original Swift wasn't. With but 85 HP, the post-war, two-seat, tailwheel retract would barely climb out of its own way. However, its fighter-like handling, good looks and aerobatic ability, plus a management decision to almost immediately certify a model with 40 more HP, generated an enduring core of aficionados. Globe and its follow-on manufacturer, Temco, created a true sport airplane that is demanding of its pilots, rewarding to those who can fly rather than drive, and proved to be amazingly amenable to being extensively modified.

For the buyer considering a Swift, the question isn't so much whether but which. Although there are only about 700 in the U.S., few aircraft have as many STCs and field approvals for conversions as the Swift. The newest Swift is more than 60 years old, and the typical airplane has seen so many mods that we can easily say that no two Swifts are identical.

MODEL HISTORY

Swift history is rich, complex, sometimes a bit vague and seems possessed of its share of Texas tall tales. As accurately as we can determine, the story begins in the mid 1920s, with a Texan named John Kennedy (no known kin to the political Kennedys) who established Globe Laboratories, which made a serum to combat black leg disease in cattle. Kennedy did well, even during the Great Depression, and initially invested his wealth in thoroughbred horses. Becoming bored with horses, and still being flush, he decided to invest in aviation.

Kennedy bought into Bennett Airplane Corporation, a company that was attempting to build a "plastic" light twin. It wasn't plastic as we know it, but rather Duramold (or Duraloid, reports vary), which was a cutting-edge process of impregnating wood with a phenolic called Haze-klite and bonding it under pressure to make an extremely strong, light structure. A certain Howard Hughes made his HK-1 Hercules largely of Duramold.

The typical airplane has seen so many mods that we can easily say that no two Swifts are identical.

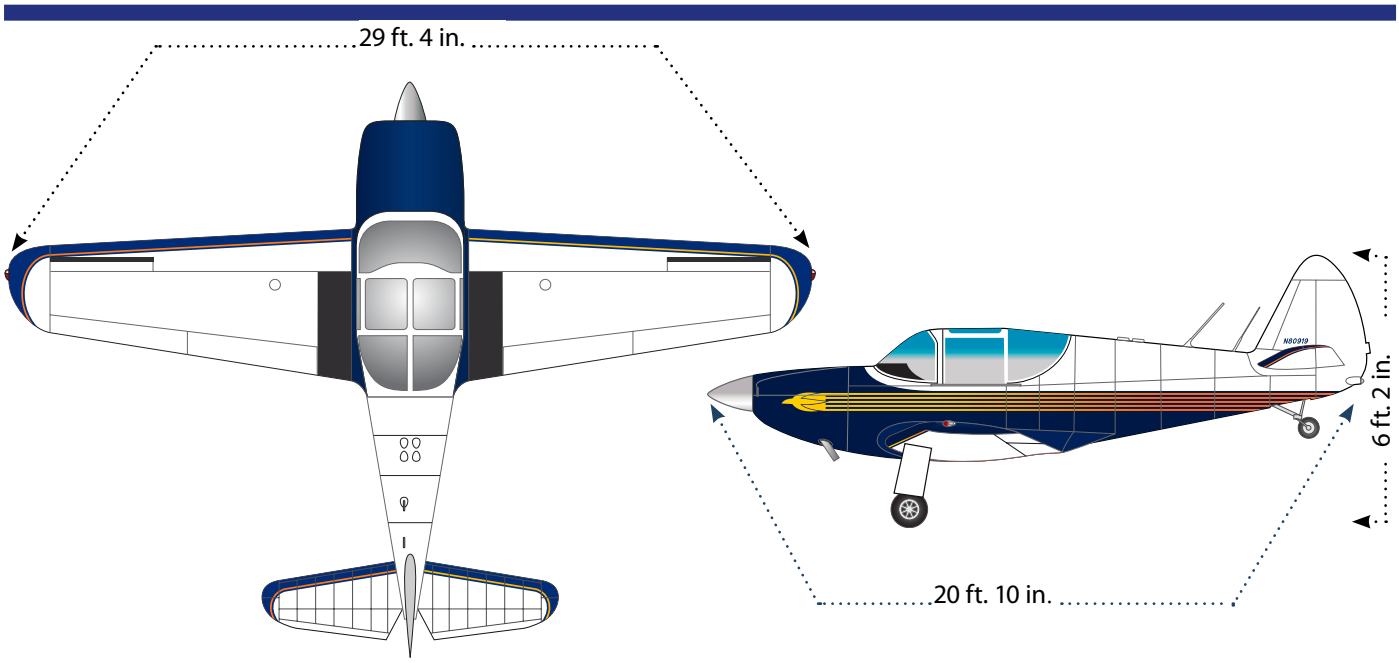
The plastic twin lost out to the Beechcraft AT-10 in competition for a military production contract; largely putting paid to the Bennett company's prospects.

However, just about that time Kennedy got to know one Rufus "Pop" Johnson, who had built his own wood-and-fabric copy of the Culver Cadet and was looking for someone to put it into production. Bennett Airplane Corporation slid into bankruptcy. Kennedy took it over and reorganized it as Globe Aircraft Corporation, intending to build Johnson's airplane, to be called the "Swift."

The original Swift had a Duramold-covered main spar, retractable, conventional gear that were hydraulically actuated, manually operated split flaps, an 80-HP Continental engine and an adjustable, wood prop. It appeared in the 1941 issue of *Jane's All the World's Aircraft* as capable of carrying two people 600 miles at 130 MPH. Service ceiling was claimed as 16,200 feet.

During the 1941 developmental program, Globe's marketing was so successful that it generated orders valued at over $1 million and lined up some 40 dealers. At the same time, management disagreements lead Pop Johnson to depart and

GLOBE/TEMCO SWIFT

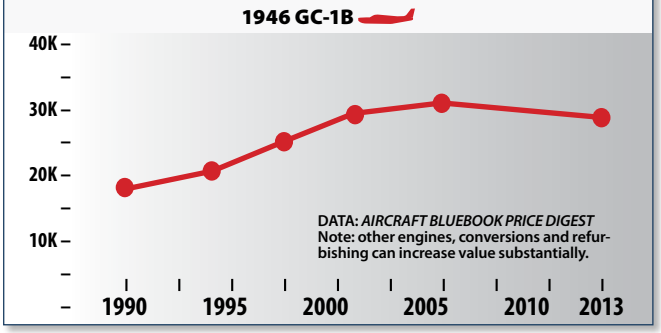


drawings courtesy
www.schemedesigners.com

GLOBE/TEMCO SWIFT SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1946 GC-1B	125-HP CONTINENTAL C-125-2	1800	$20,000	26 GAL	460 LBS	110-120 KTS	±$28,000
1947 GC-1B	125-HP CONTINENTAL C-125-2	1800	$20,000	26 GAL	460 LBS	110-120 KTS	±$29,000
1948 GC-1B	125-HP CONTINENTAL C-125-2	1800	$20,000	26 GAL	460 LBS	110-120 KTS	±$30,000
1949 GC-1B	125-HP CONTINENTAL C-125-2	1800	$20,000	26 GAL	460 LBS	110-120 KTS	±$31,000

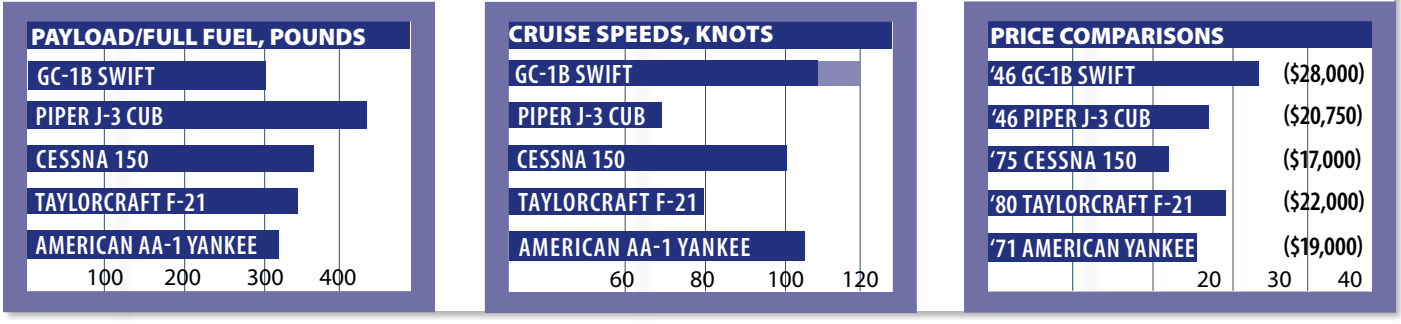
RESALE VALUES



SELECT RECENT ADs

AD 2006-12-07	INSPECT CERTAIN BRACKETT AIR FILTER ASSEMBLIES
AD 64-05-06	ENGINE MOUNT CORROSION INSPECTION
AD 58-10-03	ADD EXTERNAL STOP TO LANDING GEAR STOP RING
AD 56-16-04	LANDING GEAR TORQUE KNEES INSPECTION/REPLACEMENT
AD 51-02-02	REMOVAL OF ASBESTOS FROM HEAT MUFF

SELECT MODEL COMPARISONS



The Swift's main gear wells generate significant drag as the airplane approaches a three-point attitude on landing.

eventually form a company where he could build airplanes as he wished, going on to design the sometimes frightening Johnson Rocket. With the U.S. entry into World War II, Swift development stopped. Globe built Beechcraft AT-10s under contract as well as components for the Curtiss Commando and Lockheed Lightning.

In 1944, Kennedy had Globe engineers rework the Swift design. What emerged, the GC-1A, was something that looked similar to the pre-War Swift, but was all-metal, with hydraulically operated landing gear and flaps and an 85-HP Continental engine.

In January 1945, the prototype GC-1A Swift began flight testing. To facilitate construction, a drag-inducing, angular break had been added just aft of the cockpit—testing revealed it meant slower cruise speeds than had been observed with the pre-War model. Nevertheless, with a gross weight of 1570 pounds, it was capable of 120 MPH on 85 HP. Flight testing also uncovered an inability to meet CAA requirements for approval for intentional spins. Facing time and resource pressure, the decision was made to stop trying for spin certification and placard the Swift against intentional spins.

In May 1946, the new Swift was awarded its Type Certificate. Pre-certification demand had been far beyond Globe's dreams and capacity. It contracted with Texas Engineering and Manufacturing Company (Temco), which was made up of laid-off engineers and workers who had been building the North American P-51, to also build Swifts.

The GC-1A immediately demonstrated notable shortcomings in service—a stunning absence of short field performance and terrible ground handling due to a full swiveling tailwheel.

Globe managed to certify a 125-HP version, the GC-1B—with a steerable tailwheel—in a matter of months, thus solving the GC-1A's problems. But sometimes early damage to an airplane's reputation, deserved or not, can't be fixed. The bottom fell out fast. By the end of 1946, there were unsold airplanes filling fields.

About that time Temco figured out that Globe was selling the airplanes for $300 less than they cost to build. The price had to be increased, further hurting sales. Globe went bankrupt in early 1947, owing Temco some $1.3 million. Temco acquired what assets there were, made improvements to the Swift, including a better rollover structure, hat shelf and rear windows, and managed to sell the airplanes at a profit through the middle of 1951.

Sources disagree on the total number of Swifts built—it is probably between 1500 and 1521 airplanes.

In the late 1940s, Temco also developed and sold a few copies of a tandem-seating, 145-HP military version of the Swift called the T-35 Buckaroo.

The Swift Type Certificate and tooling was sold to Univair, which built parts rather than airplanes and helped keep the fleet in the air. Yet the Swift became almost a schizophrenic—every airport seemed to have one in the weeds, corroding away while others were lavished with affection that included a stunning assemblage of modifications from ever-larger engines through airframe clean ups and system improvements.

In 1968, a Swift owner, Charlie Nelson, formed what evolved into the Swift Museum Foundation to support Swift owners. In the 1970s, perhaps because the Swift proved to be so friendly to performance-enhancing modifications, the airplanes steadily became more popular. In 1980, Nelson's organization purchased the Swift Type Certificate and tooling, moving them to McMinn County Airport in Athens, TN, now the home of the Swift Museum and source of Swift parts, institutional knowledge, owner guidance and an annual fly-in.

FLYING THE SWIFT

We cannot over-emphasize the need for a checkout by a knowledgeable Swift instructor. While most of the behind-the-hangar denigrating tales of the Swift aren't true ("it won't take off in a left crosswind," "it rolls upside down if you stall it"), it was never a plain vanilla airplane. A lot of over-confident, high-time pilots have wound up in the buckwheat because they did not respect the Swift's need for attention on the ground or have been stuffed into the ground after a stall in the pattern.

The Swift Museum Foundation offers substantial guidance to first-time Swift flyers and buyers. The website www.saginawwings.com has several pages of advice from Swift pilots on flying the airplane as well as a list of Swift instructors.

John Davis, retired airline pilot and certified Swift instructor, with more than 3000 tailwheel hours and

One of the many Swift mods is a lower drag windshield and sliding canopy.

more than 1000 hours in Swifts, made the need to respect a Swift clear to us in an interview some years ago, "The Swift is not just another tailwheel airplane. This is a high-performance, retractable-gear airplane, whereas most other tailwheel airplanes have fixed gear with fixed-pitch propellers—they are not considered high performance."

Davis stressed, first of all, that three-point landings are not the routine. "When you get the Swift slow, with the gear and flaps extended, it is in a higher drag condition than a lot of pilots are used to. It doesn't take much for the airplane to slow further, very quickly. If you are still two or three feet in the air when this happens, a high sink rate develops faster than you can believe, and you will drop the airplane in for a hard landing or worse."

In our research into the Swift, we found that, unlike virtually all other single-engine tailwheel airplanes, no one recommended making three-point landings until building up significant experience in type. In three-point attitude, touchdown is very near the stall, the drag increase during the round out is not linear, and the horizontal stabilizer and elevator lose effectiveness in ground effect. There is little room for error.

While the stories of the airplane being unable to take off with a left crosswind are not true, it is challenging. Raising the tail too early means the rudder may not be effective enough, by itself, to stop the airplane from turning left—right brake application may be needed, which can go wrong if not done judiciously. We were told to keep the tail on the ground until achieving at least 40 MPH.

The particular engine installed, from 85 to 220 HP, means that specialized knowledge in the handling, and modified systems—notably fuel tankage—is needed.

On top of that, the human factors design of the original airplane was lousy—the landing gear and flap switches are below the pilot's control wheel; the flap switch is shaped like a wheel, while the gear switch looks more like a flap.

Once in the air, the airplane is delightfully light on the controls. It is aerobatic with snap rolls approved but spins prohibited. Our opinion regarding committing akro in a 65-year-old, light airplane is that it should be done only after assuring oneself of the integrity of the airframe. The sheer joy of flying a Swift overcomes the travails one can suffer when it is on the ground and is the reason, we believe, that so much modification attention has been lavished on them.

Cruise, in the 125-HP, GC-1B can be as high as 140 MPH at 2600 RPM. The roll rate is pleasantly rapid, and elevator forces are light enough that a pilot new to the Swift may inadvertently stall the airplane in a steep turn while just intending to apply back pressure to keep the nose up.

So long as the ball is centered, the stall is tame, although the airplane is so deep into the high-drag regime that the nose must be lowered noticeably in the recovery—it will not power out of a stall—some altitude loss must be accepted or there is risk of a secondary stall. If the ball is not centered when the stall breaks, the Swift will roll off smartly, requiring assertive application of appropriate rudder and nose-down elevator.

Even with the light controls, the Swift is stable in cruise—it will stay where you put it. We received reports that it is a satisfactory IFR platform.

As a tradeoff for the unpleasant unpredictability of three-point landings, wheel landings in a Swift are easier than in most other tailwheel airplanes. It does not seem to want to bound back into the air if things are not done precisely right as with the spring-gear airplanes. Once the tail comes down, the view over the nose isn't great—it's blind anywhere to the right of almost straight ahead. S-turns are necessary when taxiing.

MAINTENANCE, ADS

With mods that allow one to install 90-, 145-, 150-, 180-, 200-, 210- and 220-HP engines, close the leading edge slots, install a bubble canopy, replace the control wheels with sticks, enclose the gear, retract the tailwheel, rework the fuel system, increase the fuel system capacity and change the twist of the wings, to name a few, finding parts and someone to work on the airplane can vary from easy to impossible.

The Swift Museum Foundation has a parts department that sells airframe parts; it has OEM sales approval for Continental and Lycoming engines as well as Hartzell and McCauley props.

Because the airplanes tend to be highly modified, a pre-buy inspection should include a very detailed examination of the paperwork to assure all the 337s and STCs are in order.

Reader feedback was consistent in saying that having the airplane and

Globe Swift Accidents: A Mixed Bag

We didn't uncover a smoking gun when we studied 25 Swift wrecks, spread out over a 13-year period. Four of those crashes were fatal. As expected from a tailwheel aircraft, RLOCs, for runway loss of control, were the top causes.

Whether it's failure to maintain control in crosswinds or botching a landing or takeoff, the little Swift deserves respect.

With its retractable landing gear, things get dicey in the hands of ham-fisted pilots. For example, there were several reports where Swift's—following an aborted landing—departed the runway and into the weeds, collapsing the main landing gear.

There were other crashes where pilots just didn't do a good job of handling a go-around and stalled the airplane over the runway.

We found a half-dozen stall and spin wrecks—where pilots let the airspeed deteriorate too far and didn't recognize it, not only in landing configuration, but also during the initial climb as well as while maneuvering.

Some of these stalls and spins followed engine failure, including a connecting rod bearing failure and subsequent connecting rod separation from the crankshaft of the engine. On the topic of separation, one GC-1B lost two McCauley propeller blades while maneuvering during an airshow. The stressed propeller hub assembly subsequently separated from the engine crankshaft.

Based on our research, we think pilots need to respect the Swift's tailwheel and the lower end of the airspeed indicator.

its paperwork not line up can be very expensive if caught on the first annual and not on the prebuy.

The next issue is corrosion. The airplanes are now over 60 years old and corrosion is a major consideration. Mechanics find corrosion in the vertical fin, tailwheel area, around the horizontal stabilizer, on wing skins and the spar cap extrusions.

We counted 19 ADs on the GC-1A and 20 ADs on the -1B. When doing an AD search, look under Swift Museum Foundation rather than Globe or Temco, as the ADs are listed under the name of the Type Certificate holder. The vast majority of the ADs were issued prior to 1965, but that doesn't mean all were complied with.

PERFORMANCE

Don't expect to find any handbooks on performance. With all the various engine-propeller combinations, the buyer has to fly the airplane to figure out what it can and cannot do. One problem may very well be the legal weight and balance. Over the years, the Swifts have added more than a few pounds. We were told that very few Swifts can be found with an empty weight as low as 1200 pounds, most are around 1300 pounds. Some chubby Swifts with the big engines weigh more than 1500 pounds empty, which can cause a problem if they don't have the STC for increased weights. The standard maximum is 1710 pounds, with an STC to increase weights to 1835 pounds for airplanes with engines up to 180 HP. 180 HP and above can be approved up to 1970 pounds. The problem becomes obvious.

The standard Swift has 26 gallons or 156 pounds of fuel in the main tanks. With two 170-pounders in the seats, it means the Swift has to weigh less than 1214 pounds for a legal weight—which may not be happening. You can have the Swift checked for unwanted pounds. We were told of mechanics who have taken as much as 125 pounds off a Swift. One found wiring harnesses left over from various additions. We were also told of finding every kind of insulation including household and automotive and three layers of paint.

MARKET SCAN

It's difficult to set a standard price for a Swift because of the number of mods. However, for a GC-1B with the standard 125-HP engine, a good baseline is between $28,000 and $31,000. After that, prices can take off, although we've noted that prices of the top-end 200 HP and above Swifts (often referred to as the Super Swift) are not quite as high as they were five years ago. For example, on the saginawwings.com website, there are a number for sale ranging from $39,900 for a Swift with a 145-HP engine, to a 180-HP Swift with a long paragraph of mods posted at $80,000. We have seen Super Swifts change hands at prices north of $100,000 in the past. In our most recent scan of the ads, the highest asking price we saw was $98,000 for a 210-HP Swift with a boatload of mods.

TYPE CLUBS

The Swift Museum Foundation, www.swiftmuseumfoundation.org, is, in our opinion, a must-join organization for anyone contemplating Swift ownership. It provides a wealth of technical knowledge and a supply of parts.

OWNER FEEDBACK

I have owned my Swift since 1981. I replaced the engine with a 210-HP Continental IO-360. I had previously owned a 145-HP Swift—there is no comparison between the two. With the 210-HP engine, performance is greatly enhanced. It responds unbelievably, and is more like piloting a military fighter rather than a civilian pleasure craft. In over 60 years of flying, I have owned and operated many type of aircraft, and my two favorites were the Learjet 35 and my modified Swift.

As a converted Swift, one must pay attention to the greatly increased torque, especially on takeoff. Once airborne, it flies like a homesick angel and, for me, it has no bad habits. In the air, it handles like any other

Main gear is slightly exposed in flight; nose grill provides air for the draggy updraft cooling.

plane, but I would highly recommend getting checked out by a CFI who is familiar with the aircraft prior to trying to fly one on your own.

For anyone considering purchase of a Swift, I recommend joining the Swift Museum Foundation, not only for the camaraderie, but also for ready access to repair parts and maintenance guidelines. As with any aircraft of this vintage, corrosion is of concern and due diligence on a pre-purchase inspection is certainly advised.

Jim Nixon
Via email

The Swift is a joy to fly. When my nephew, James Mack, and I restored our 1946 model, we heard lots of stories of how hard the plane is to fly. We found the handling straightforward; it was not a beast.

It does require lots of attention and requires a checkout by someone that is familiar with the type. To me, it is no harder to fly than a Super Cub. It does great on well-groomed grass strips.

If you want attention, this is the plane. We get questions and comments everywhere we land. It is as close you can get to a warbird for under $100,000. An RV-8 is a close competitor to the Swift in terms of fun, but the Swift can be purchased for less.

The Swift Museum Foundation is a great source for everything to do with the plane. Join. They can help in all aspects of owning and flying the plane.

There are several knowledgeable Swift experts that are easily found. James and I are great examples of non-experts that still enjoy the plane.

As far as speed, the 125-HP planes are not that fast, but lots of fun getting there. The 160- and 180-HP ones have good cross-county speed and the 210 HP is the fastest. There are lots of mods for the type. Control sticks and landing gear updates were the mods at the top of our list.

Owning a Swift is one of the most enjoyable experiences I have had in aviation.

Steve Pittman
Via email

I have owned and operated a nearly original "stocker" for 18 years. I rely on a number of experts, including the Swift Museum Foundation, which has volumes of information including archived data on STCs, 337s, ADs, field approvals, qualified shops and instructors, owner lists and a full history of the Swift. It's a well-run, solid organization that offers great support.

I was first attracted to the Swift for its flying qualities and light controls. It flies like a fighter and is commonly referred to as the poor man's P-51. The hot rod nature of the Swift lends itself to the existence of examples that possess mods without paperwork, something buyers need to beware of. I understand that the

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Gear and flap switches are below the pilot's yoke—the wheel-shaped one works the flaps, the red lever operates the gear—beyond that, expect to see almost anything on the modified panel of a Swift.

Swift has more STCs than any other airplane.

I transitioned into the Swift with 200 hours total time, all in a Cessna 150. I found it an easy airplane to learn. I took 10 hours of dual with an instructor who had Swift time and 700 uneventful hours later, would highly recommend a Swift to anyone looking for a "pilot's airplane." Wheel landings are preferred, which make the airplane easy to manage.

I suggest choosing a mechanic who knows Swifts or at least is comfortable with working with a 65-year-old airplane.

The airframe is sturdy, stressed for plus 7 and minus 3.5 G, making it a platform for "gentleman's" aerobatics, which are a lot of fun.

My airplane has been modified with a 145-HP engine, has 37 gallons of fuel, which gives me 3.4 hours at 140 MPH. It will do 154 MPH at full throttle. The 100 pounds of baggage capacity are adequate. My airplane has been a reliable and low cost. The O-300 engine and fixed-pitch prop have been bullet-proof and simple to maintain—same for the airframe and landing gear.

Terry McCartney
Via email

Swifts are great to fly, truly a mini fighter with very light controls that does "old man akro" really nicely. The big-engine Swifts climb well and have good cruise speed. The ideal Swift is the 210-HP mod with sticks, bubble canopy, gross weight increase, aux tanks and Cessna 150 seats. My current Swift has all of those mods plus small wheels, flat panel, GAMIs, electric trim and Cleveland brakes. Some have clipped wing tips, smooth wing skins, leading edge slots covered over—the list goes on and on.

I suggest that any prospective owner contact the Swift Museum Foundation to get all the manuals, look on the saginawwings.com website for information and also visit with someone who owns a Swift.

As far as pilot skills, a competent tailwheel pilot should have no real problem transitioning. Most Swifts only have brakes on the left side, so you have to pick an experienced Swift instructor to evaluate your skills to make sure you are good enough to handle it on the ground.

The big-engine Swifts require a bit more care with speed control on landing. Wheel land until you get some experience before trying a three-pointer, and don't flare too high as the airplane pays off quickly.

As far as maintenance is concerned, it helps to have someone who is familiar with Swifts to do the work, but if you take the time to learn its quirks—the website is helpful—it isn't a hard airplane to maintain. Corrosion in the fuselage is something to check, plus it's essential to make sure the paperwork for all the mods is in order.

Unless you live near sea level, the 125-HP Swifts are pretty marginal in climb and they don't carry anything. I would not get anything less than a 150-HP Swift with the constant-speed prop. The 180-HP and 210-HP Swifts are the most preferred.

Bill Coombes
Via email

Owning a 180-HP Swift has been an adventure. I made more go-arounds in the first year than I had done in all the previous years of flying in the military, general aviation, Part 135 and the airlines.

With an HIO-360 (field approval) pulling the Swift around, I can expect about 3 hours flying before I land. I have 26 gallons in the wings and an aux tank holding 9 gallons. Leaned out, I burn about 9-10 gallons an hour. I routinely plan for a true airspeed of 135 knots.

The Swift is a conversation piece. Many cannot believe the airplane is over 60 years old (mine is a 1946 GC-1B). Once when I landed in Oklahoma, the tower asked when I was planning on departing. When I asked why they wanted to know that, the tower chief said they were closing the tower "...in about 30 minutes and we have never seen one of those things up close. Would you mind waiting a few minutes so we can see it?" I gladly obliged.

I ran across the Latin term, «ancora imparo», which roughly translates into "I'm still learning." For the pilot who wants a Swift or who is flying a Swift, it is a good motto to adopt because the Swift is always ready to teach you a new lesson.

John Wiley
Atlanta, Georgia

As a long-time reader, I am glad to see the Swift get some attention. I have had four Swifts, the first pur-

A close-to-stock Swift panel is a study in Art Deco design

chased in the early 1980s for $8700. All Swifts fly great; with light control forces, it is good for light aerobatics or just having fun. I put Swifts and Corvettes in the same class. They are not the most practical things, but they sure are fun to have.

I am just an average pilot and have had no trouble in takeoffs or landings in wind. I have landed in wind that would have scared me if I knew it was that strong, but the airplane handled it well.

The Swift would be a good trainer for anyone about to get checked out in a real P-51 Mustang. The takeoff and landing characteristics are much the same. I once splurged and bought an hour in the P-51 Crazy Horse and it was so much like the Swift, I was right at home.

The retractable landing gear is mostly trouble free if you maintain it like any other retractable. It is electric/hydraulic; if you lose electric power, it has to be hand cranked down. I have done that once when a generator quit, and I ran the battery down before I caught it.

The Continental O-300 145-HP engine is a common mod for the Swift. The earlier ones had a pull-type starter engagement. The O-300D is more desirable because of its normal key-start capability, its alternator instead of a generator and a vacuum pump. You will find all of the small Lycomings up to 200 HP in Swifts, but the most popular big engine is the Continental IO-360 of 210 HP. A pure stock 85-HP Swift is rare—you can never have too much horsepower.

Some popular mods for Swifts are removing the control wheels and putting in sticks, removing the entire top of the cabin and replacing it with a bubble canopy, closing the slots in the wings, adding fuel capacity for the big engines, gross weight increase, full IFR panels. In short, they can be highly modified.

I am an A&P, so I usually do most of the actual work on my airplane and get an inspector to check everything and do the paperwork part. Annuals usually cost me $500 per year.

Part of owning a Swift is ego; it feels good when you stop somewhere for gas and the crowd comes out of the FBO to look, especially when the quarter-million dollar spam can beside you is being ignored.

Marvin Homsley
Via e-mail

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AVweb's TOP FIVE

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The Aviation Consumer

Recurrent Trainning

(continued from page 18)

motion," however, they are FTDs and will allow a pilot to obtain an IPC if s/he has been current within 12 months of the training session. Airplane training is offered at the Scottsdale facility, otherwise, we were told that completion of the course does not include a flight review sign off.

We were advised that SIMCOM, "as with its competitors," does not publish its prices and did not share them with us. Our research showed that all of the other recurrent training organizations did disclose their prices.

SIMCOM's website does not provide much information. If you are interested in scheduling training, we recommend that you not waste time with the website; call them up and find out which facility offers training for the type of airplane you desire, when, how much it will cost and the contents of the syllabus.

FLIGHT LEVEL AVIATION

Flight Level Aviation, in Waynesburg, PA, was founded by Dr. Richard Kaplan, a physician and CFI. He brought a full-motion simulator to GA recurrent training some years ago and currently offers training focused on the simulator (which is classified as an FTD) and in the client's airplane. The simulator can be configured as a generic single or twin with round gauges—Dr. Kaplan explained that the instructors are specialized by type of airplane, so the fact that the simulator doesn't replicate a specific airplane is not important. We agree—with the wide variety of avionics and mods in various general aviation airplanes, we believe that the sim allows training in procedures, emergencies and upsets, while a knowledgeable instructor brings in the specifics of the type of airplane.

Dr. Kaplan pointed out that Flight Level's training is tailored for each pilot based on the type of flying, level of experience and type of airplane and that a good instructor can make training realistic.

Flight Level does single and multiengine, piston recurrent training, but specializes in the Cessna 210 and Beech Bonanza series. An IPC and flight review does require airplane time, according to Dr. Kaplan. Training is flat-rated at $500 per day—most clients complete the training in one to two days.

CENTURY AIR

Century Air, based at Essex County Airport in Fairfield, NJ, does piston single and twin and some turboprop recurrent training using both round-dial and glass Frasca simulators. Company president Richard Greene, a retired airline pilot, follows an aggressive, train-to-proficiency, recurrent program. His company focuses on single and twin Cessnas, Pipers, Grumman-Americans and the Cirrus line as well as the TBM-700.

Greene emphasized his concern with what he has seen as a developing "automation dependency" among pilots and his company works to assure that clients can handle anything that comes their way when the automation breaks down.

As a sample, recurrent training in a Baron takes place over two days, includes six hours of ground training and seven hours in the simulator. Cost is $1950. If training in the client's airplane is desired, the cost is $100 per hour.

CONCLUSION

When you are in the market for serious recurrent training, there are good choices at reasonable prices. For the money involved, an acceptable program should allow you, assuming you demonstrate the requisite proficiency, to walk out instrument current and with an FR signoff. Training in the airplane only is good, in the airplane and simulator is better. A motion simulator is of no extra value.

FEEDBACK WANTED

PIPER WARRIOR

For the August 2013 issue of *Aviation Consumer,* our Used Aircraft Guide will be on the Piper Warrior series, the airplanes that emerged when Piper put a longer, semi-tapered wing on the Cherokee 140 to compete with the Skyhawk. We want to know what it's like to fly and own these planes, how much they cost to operate, maintain and insure. If you'd like your airplane to appear in the magazine, send us any photographs you'd care to share. We accept digital photos e-mailed to the address below. We welcome information on mods, support organizations or any other pertinent comments. Please send correspondence on the Piper Warrior by June 1, 2013, to:

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