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The Aviation Consumer

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DYNON'S NEW APPROACH TO AVIONICS INSTALLS

With its Certified SkyView HDX line, Dynon is seeking to effectively upend the established way of doing business in the world of avionics upgrades. Rather than only building dealer relationships with avionics shops that act as sales agents, Dynon will push the idea of any shop with a qualified A&P/IA installing this equipment. Some in the industry—including competing manufacturers and some avionics shops—have criticized this idea, perhaps for the wrong reasons.

The Dynon Certified retrofit glass system started life in the experimental market as the HDX, but now has an STC for installation in Cessna Skyhawks and soon, some models of the Beech Bonanza. The company has plenty of other airframes on its STC to-do list. But while the Skyhawk STC has been in place for a while, not many have been installed, likely because there are just two shops authorized by Dynon to do it: Thrust Flight in Texas and Merrill Field Instruments in Alaska.

The lack of an established dealer network for such a sizable product line is surprising, and Dynon's Michael Schofield told me the company is sorting out which other shops it will select as authorized Dynon Certified installation centers. It will be a network that's different than the one for Dynon's experimental products. In the interim, it will be up to the aircraft owner to nominate an A&P with IA (inspection authorization) credentials to do the installation. The customer contracts directly with the installer for all aspects of the install, including instrument panel modification or fabrication. While some have suggested these major avionics retrofits—which include Dynon's integrated autopilot—should be left to an avionics repair station, I think that's a shortsighted, old-school way of thinking. I've seen plenty of horrific installs turned out by avionics shops and plenty of best-of-show projects done by IAs.

For talent that fits somewhere in the middle, Dynon insists that an A&P with a current IA certificate should be more than qualified to install the Certified HDX line and in many circumstances, I agree. An IA has much of the same inspection and signing authority as an FAA repair station, plus many avionics repair stations have IAs on staff. Suggesting that a competent and practicing IA (two imperative prerequisites) isn't qualified to do the job might be insulting, especially considering the number of successful experimental avionics that have been installed by homebuilders who have little if any avionics experience at all—and not just Dynon equipment. Garmin's G3X Touch suite (which includes an autopilot) is installed in a wide variety of IFR-flying experimental amateur built aircraft. You don't have to hold any certificate to put one in.

Historically, Dynon has done a pretty good job of designing products that curtail and simplify the installation effort. It provides preassembled wiring harnesses and is simplifying and customizing the installation hardware for easier retrofit. Dynon's field support and installation documentation is quite good, based on my own experience. But Dynon isn't putting faith in every A&P/IA without doing some vetting first, although Schofield told me it's the aircraft owner's responsibility to ensure the work being done is airworthy. Still, Dynon won't sell the STC authorization—which will specifically identify the name of the installing IA (or an FAA repair station)—or honor the warranty without verifying that the individual selected by the customer has the right credentials. After all, the IA or repair station will be accepting the liability by signing the FAA Form 337. The installation also requires a flight manual supplement, a revised weight-and-balance report, a logbook entry and instructions for continued airworthiness.

continued on page 32

AVIDYNE CUSTOMER SUPPORT

Congratulations on a great field report article on the Avidyne IFD550 in the September 2018 *Aviation Consumer*. As I'm sure you know, the IFD navigators have gone through many software changes since their introduction and continually get better, plus they have more functionality based partly on suggestions from their users.

One thing that wasn't mentioned in your coverage is the commendable customer support that Avidyne provides to its customers. On a recent flight to the Bahamas from the Northeast area my IFD550 died completely while I was flying 60 miles off the coast of Florida. I was unable to navigate with it or even transmit with its comm radio.

When I landed, I sent an email to Avidyne's technical support wondering how I would get home if my second IFD navigator had a similar issue on my trip, and how soon I could have it replaced once I did get home. I got an email back from Avidyne asking what airport in Florida I would be using to clear customs on my return. When I told them I would be using Treasure Coast Airport in Fort Pierce, Florida, they told me a replacement IFD550 would be waiting for me, along with an installer to put it in.

That type of customer service is totally off the charts and your readers should know about it.

Larry Levin
Lincoln, Rhode Island

Thank you for the thorough article on Avidyne's IFD550 navigator. I was an early adopter and have the IFD540. Your article didn't mention if there is an upgrade program to step up from the IFD540 to the flagship IFD550. Is there?

Steve Herrington
via email

Avidyne offers a trade-up exchange program. You send your existing IFD540 to the factory and for $5000, Avidyne sends a new IFD550. The trade-in unit is subject to review by Avidyne for operation and cosmetic condition.

ROLL YOUR OWN FLIGHT TOTE

I know you've evaluated compact aviation flight totes, but I found something that might be of interest to your readers. I was looking for a top-loading compact flight bag that would hold two headsets, a Garmin aera 795 portable GPS, a Zuluworks kneeboard and an iPad, along with a pocket or two for extra batteries, flashlight and pilot's manuals. I checked the bags available at the usual vendors at AirVenture this year and didn't find what I was looking for.

Since then I found that a $50 Canon 200DG camera bag worked beautifully. If you fold the earcups of Lightspeed Zulu headsets flat you can fit two headsets, the kneeboard with logbook and an iPad in the top loading main compartment, plus the Garmin aera 795 in its storage case will fit in the large front pocket. The pocket inside the top flap will hold the Garmin and POH manuals and there are end pockets for miscellaneous items. The top flap is secured by Velcro strips on the ends and two straps with quick-clip-type buckles. There are two straps at the front of the bottom for lashing a tripod to the bag. They are not obtrusive, could be used for an umbrella or just cut off.

Mark Burns
via email

FAA'S NORSEE POLICY

I'm confused about the FAA NORSEE (non required safety enhancing equipment) policy and I'm trying to replace an RC Allen electric standby attitude gyro with a digital attitude indicator.

Why can a Dynon D3 be installed, but a Garmin G5 can't be installed as a backup?

Rolf Scholz
Columbus, Indiana

The Dynon is a portable unit and an apples to oranges comparison to Garmin's permanently installed G5. Still, we asked Garmin's Bill Stone for comment.

"FAA NORSEE guidance (FAA Policy number PS-AIR-21.8-1602) is a vehicle to obtain design and production approval; it is not a method to achieve an installation approval. NORSEE provides guidance and procedures for issuing a design and production approval to a U.S. manufacturer pursuant to 14 CFR 21.8(d) for equipment designated as NORSEE that is determined to be a minor change to type design and whose failure condition is minor. NORSEE approval under this policy does not convey an approval for installation in a type-certificated aircraft, it is only a method of approval for manufacturing and marketing/distribution. Installation and approval of NORSEE equipment is separate from the design/production approval, and often may require costly field approvals.

With the G5, we chose to obtain design and production approval via more traditional PMA methods, in conjunction with installation approval via an extensive AML STC. This simplifies and lowers costs of installation, and the PMA/STC is recognized internationally," Stone told us.

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Dimensionally, the V1.0, left, is smaller than the Cessna 172, but not so much that you'd notice at a distance. Its wingspan is larger.

AIRCRAFT FLIGHT TRIAL

Vulcanair V1.0: A Skyhawk Competitor

An Italian import with performance to match the Cessna 172 aims at the training market for $100,000 less.

by Paul Bertorelli

Two data points in what passes as conventional wisdom are that there's a looming pilot shortage and that the world will need a big fleet of trainers to fix it. The Italy-based Vulcanair wants a piece of that action and has been touring a Lycoming-powered four-place trainer called the V1.0 as an entrée into the trainer biz.

If it looks like a slightly shrunken, boxy version of the Cessna 172, that's no surprise because given the laws of physics and aerodynamics, any sketch-pad rendering of a high-wing trainer will look like a Skyhawk, even if the struts are optional.

Vulcanair is aiming an emerging marketing effort at institutional sales—the flight academies and schools of all sizes—where Cessna and Piper have been duking it out with $400,000 airframes.

They'll be competing with a competent albeit not exceptional airplane that's more than $100,000 cheaper than the competitors—$278,000 base. The V1.0 has just enough real-world payload to make it a realistic choice. If the world really wants cheaper airframes—and it's not clear that this is a burning wish for big schools—Vulcanair wants to provide one.

Vulcanair is relatively unknown in the U.S., although it has a more visible presence in Europe, with regular appearances at the big Aero show in Friedrichshafen. Vulcanair began life as an aerospace parts manufacturer in 1996 and it leveraged its experience in the European market to purchase the assets of the bankrupt Partenavia through a third-party sale in 1998.

Vulcanair found some other designs and companies to buttress its business, including the SIAI Marchetti SF.600, a large utility-type twin aircraft that was eventually morphed into a single-engine version similar to the Cessna Caravan. Neither of these was ever put into series production.

However, the Partevania purchase got Vulcanair the rights to the P68, a Luigi Pascale-designed twin that found a market in the training and light transport segments. It's powered by a pair of Lycoming IO-360s. Vulcanair lists six variants of the P68, including the P68R retractable and two Observer versions, one of which features a glazed nose for observation and patrol work. A stretch version of the aircraft, called the A-Viator, is powered by Rolls-Royce 250B turboprops and carries nine passengers and two crew. There are 49 P68s in service in the U.S., including three turboprop versions, according to the FAA registry.

The V1.0 is Vulcanair's first foray into the single-engine trainer market, although it's not entirely a clean-sheet design. Prior to being acquired by Vulcanair, Partenavia had developed an airframe called the P64 in two variants, the first dating to 1965. A bit more than 100 total were built and many are still flying in Europe.

The V1.0 is a developmental offshoot of the P64, but Mike McCann, marketing VP for Vulcanair's U.S. marketing company, Ameravia, says it's somewhere between a clean-sheet airplane and a revision of the original P64, which was also a high-wing strut-braced design, also with the third rear cabin door.

Pascale also designed two- and three-seat versions of the airplane called the P66B, C, D and T. These models saw higher production, totaling nearly 240 for all three models.

CHECKLIST

- ⊕ Looks like a Skyhawk, flies like a Skyhawk, but for a lot less.
- ⊕ Right-side rear cabin door makes the back seat actually useful.
- ⊕ Garmin TXi displays are a simpler, cheaper alternative to G1000.
- ~ Vulcanair needs more agressive sales and support in the U.S.

The V1.0 is built like a Mooney, top photo. A welded steel cage is mated to a riveted aluminum aft section. This provides load distribution for a rear cabin door, middle photo. A large skylight, lower photo, makes the cabin bright and airy, but also hot in summer weather.

The P66C was aerobatic and powered by a Lycoming O-320. All of these airplanes, including the V1.0, are on the same type certificate.

TUBE AND SHEET

The V1.0 is built similar to a Mooney, with a welded steel cage surrounding the main cabin married to a conventional aluminum riveted monocoque structure from the cabin aft. Like a Skyhawk, the wings are strut-braced, but the struts are aft of the main doors so ingress/egress is unimpeded.

The landing gear is spring aluminum passed through a heavy welded tubular box under the floorboards. Departing from the fashionable trend of castering nosewheels steered by differential braking, the V1.0 has an old-school steerable nosewheel. That's probably a plus for flight schools, which otherwise burn through brake pads for students riding the pedals on the way to the runway.

While Cessna and most other high wings we're familiar with have conventional horizontal stabilizers with elevators, the V1.0 sports a Piper-style stabilator with a tab for trim. Further departing from another trend—electric-only trim—the 1.0 has cable-driven manual-only trim. And that's done by a big wheel poking up through the top of the center control console. It's a welcome change from airplanes that rely only on yoke-mounted rockers for electric trim because it allows precise nudging to neutralize trim force, rather than the annoying too-fast-or-too-slow electric trim seems to deliver.

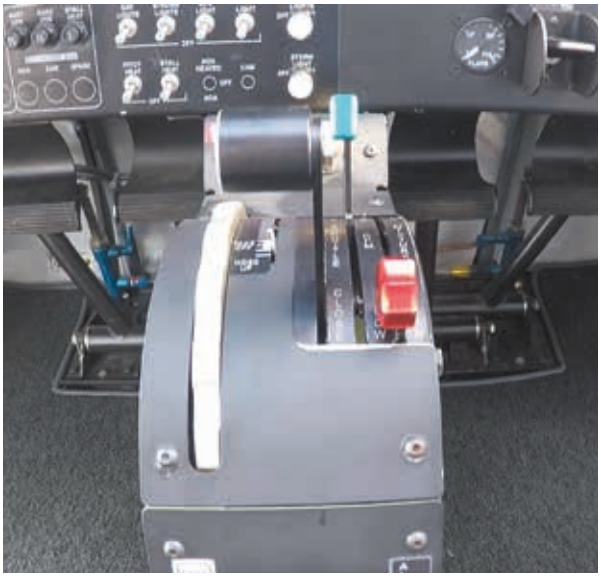
While on the topic of the trim, the center control console where it lives is one of the V1.0's nicest design features, in my view. It sensibly contains the trim, throttle, prop and mixture controls in a single, well-designed structure that puts everything easily to hand. The pedestal also houses the alternate air control and on the floor below it, jacks for the headsets and the fuel control valve. Standard is a giant fire extinguisher under the pilot's seat, also readily at hand. More airplanes would benefit from having that.

The interior is nothing fancy. There are thin floor coverings, but no upholstered side or door panels. In fact, the doors themselves are models of efficient production thinking. They're light, single-piece composites with just enough hollow space to accommodate the latch mechanism. That interior space is accessed by a removable panel that serves as a combination armrest and closing handle. The doors fit well and have a rubber gasket that seems to minimize noise and air infiltration.

Speaking of which, there are eyeball vents on the ceiling for ventilation for all four seats, but the only air conditioning option is to hold the two doors open. On a steamy Florida day in Miami, that was enough—just. But the cabin gets plenty of insolation because in addition to the door windows, there's also a rear window and a skylight. While that makes for a bright cockpit, it also makes for a warm one.

Although the V1.0's interior is utilitarian, it's not entirely without minor luxuries. The rear seating area has easily accessible headset jacks and USB charging ports. The rear baggage area is accessible through a slot behind the rear seat. Baggage capacity is 88 pounds.

YouTube **See a video on the Vulcanair V1.0 at http://tinyurl.com/j95ht2a.**



The version we flew was equipped with Garmin's G500 display, but new production versions will have the TXi system. The airplane's strongest interior feature is a center pedestal that houses trim, throttle and prop controls, center photo. Annunciator lamps show status of various systems, lower photo.

One thing that might need attention is the placement of the rudder pedals. When I flew with Chris Benaiges, CEO of Ameravia, he mentioned that tall people found them too high, causing their shins to strike the bottom lip of the panel. At 5 ft. 8 in., I didn't have that problem, but figuring out how to plant my heels on the floor and still work the pedals and brakes took some accommodation. What it really needs is pedals that are a couple of inches shorter.

With the struts placed far aft, ingress and egress are unrestricted and there's a tubular step forward of the door to assist. The seats have a reasonable range of sliding adjustment, which Benaiges told me will be increased to accommodate taller pilots. Access to the back seat is similarly unimpeded thanks to the rear door. But the door isn't exactly large, so big people will find it a tight squeeze. And both front seats will need to be set forward if the rear passengers are to have any legroom. With a tall person in the left seat, the V1.0 is a three-person airplane, despite having reasonable useful load to carry four. If both front occupants are tall, the back seat won't be as useful, unless the occupants are small.

PAYLOAD, RANGE, PERFORMANCE

The V1.0 has about the useful load and payload you'd expect of a 180-HP airplane. On a gross weight of 2546 pounds—four pounds less than a Skyhawk—it has a useful load of 860 pounds on a typical empty weight of 1686 pounds. That's functionally the same as a Cessna 172, although the V1.0 has a max landing weight of 2425 pounds, 121 pounds less than its gross. Given its structure, it's not clear why this is necessary.

In the training role, with three people aboard, the V1.0 can be topped off. With four aboard, it can carry 30 gallons of avgas for a little over three hours of endurance. Max fuel is 50.2 gallons useful, stored in two welded aluminum wing tanks joined at the left/right (no both) fuel switch in the cockpit.

Although the CG envelope narrows at higher weights, at typical loads, it doesn't take heroics to remain within it. With two people, full fuel and light bags, it's mid-envelope. With four people and full fuel—30 gallons—it's just at the northeast corner of the envelope, biased aft.

Unlike the Skyhawk, the V1.0 can operate in the utility category at all weights, although it's not approved for any aerobatics, including spins. That could be a deal breaker for some schools that want the option of spin training for CFI applicants.

Whether by dint of the constant speed prop or a little less drag, the V1.0 is faster than the Skyhawk, at least on paper. Inexplicably, it's thirstier. At about 65 percent power and 6000 feet, the Skyhawk will cruise at 114 knots on 9 GPH. Under the same conditions, the V1.0 turns in about 120 knots, but on 10.3 GPH. Throttled back to the same fuel burn as the Skyhawk, the V1.0 would cruise at about 112 knots.

The higher fuel burn dents the V1.0's range a little. At the aforementioned power setting, the V1.0 is good for 494 miles in still air, with a 45-minute reserve, against 585 for the

slower Skyhawk. On the equivalent 500-mile trip, the Vulcanair would arrive 12 minutes sooner.

FLIGHT IMPRESSIONS

The V1.0 flies like it looks: solid, workmanlike and no surprises. The Lycoming IO-360 is a good choice for lacking a carburetor and for having the constant speed prop, which students will have to deal with eventually if they're going on to professional flying careers.

In the interests of economy, Vulcanair chose Garmin's G500 for the early airplanes, but going forward, the airplane will have the new TXi touchscreen displays, with a GTN 650 driving the nav and comm. In my view, this is another wise choice, for the G1000 NXi is both expensive and technological overkill for a basic trainer. Further, it doesn't resemble the systems professional pilots will operate in jet transports, so what's the point? The TXi displays are both highly capable and easy to operate, even if the V1.0 version lacks an autopilot.

Other than the rudder pedal foible, the airplane tracks well during taxi but has a somewhat limited turning radius when hand maneuvered with the tow bar. The sight picture while taxiing and climbing is adequate, albeit limited over the nose when climbing at V_X or V_Y. Initial climb rate on a hot day was 700 to 900 FPM.

Here, I'll add my usual plaintive wish for a stick rather than yokes. The V1.0's yoke is slightly too large for the size of the airplane, although it doesn't obscure the main panel. Control forces are pleasant, if a bit heavy in pitch, probably due to the stabilator. Steep turns require either nose-up trim or an increasingly firm pitch pull.

I can't remember the last time I encountered a modern FAR Part 23 airplane with handling or stall surprises and the V1.0 has neither. It's crazy stable in pitch. When I disturbed it to provoke a phugoid, it returned to trim pitch and speed in a cycle-and-a-half. In roll, it departs more vigorously if left to its own devices from a 20-degree banked turn.

Stalls are benign, but it does take a determined pull to get the last bit of yoke travel to get anything like break. The yoke rises noticeably during that last bit of travel. It has a gentle parachute mode with no tendency toward a sharp break or a shear off into a spin. Flap deployment causes little pitching moment. The flap control, by the way, lacks presets, so there's an indicator to set it for takeoff (14 degrees) and the full 42 degrees for landing. This would be easy to add, but I'm not sure it's necessary. In passing, I wouldn't mind if the white arc was a little wider. Max flap extension speed is 78 knots indicated.

KING VS. CONTENDER


CESSNA 172

Base price
$391,000

Dimensions

Length:	27 ft. 2 in.
Wingspan:	26 ft. 1 in.
Height:	8 ft. 11 in.
Wing area:	174 sq. ft.
Wing loading:	14.6 lbs.
Max TO weight:	2550 lbs.
Typical useful load:	855 lbs.
Usable fuel:	53 gal.

Engine
Lycoming IO-360-L2A (180-HP)
McCauley prop

Avionics
Garmin G1000 NXi

Performance

Max cruise:	124 KTS/10.4 GPH
6000 ft./65%	114 KTS/9.0 GPH


VULCANAIR V1.0

Base price
$278,000

Dimensions

Length:	23 ft. 8 in.
Wingspan:	32 ft. 8 in.
Height:	9 ft.
Wing area:	144 sq. ft.
Wing loading:	17.6 lbs.
Max TO weight:	2546 lbs.
Typical useful load:	860 lbs.
Usable fuel:	50.2 gal.

Engine
Lycoming IO-360-M1A (180-HP)
Hartzell prop

Avionics
Garmin G500 TXI

Performance

Max cruise:	137 KTS/14.5 GPH
6000 ft./65%	121 KTS/10.3 GPH

CONCLUSION

At $278,000 base, variable by the Euro exchange rate, the V1.0 compares favorably to the Skyhawk on price. In fact, it crushes it. But for big schools, aircraft purchases aren't just about price. They're also looking for dispatch reliability and a support structure to match. Cessna and Piper have proven good at that, at least in the U.S.

The V1.0 appears less economical than the Skyhawk or the Piper Archer, but whether that washes out the $100,000-plus price delta for schools is an unknown. It might for some and not others.

Although Vulcanair is not pushing sales into the private owner market and Cessna doesn't appear to be either, there's no apparent reason the 1.0 wouldn't be the equal of a Skyhawk for personal use. It's a little faster and the third door is a nice add-on.

In my view, if Vulcanair wants to make a dent with this airplane, it will need to build out an aggressive sales and support structure in the U.S. If the company can fly a would-be fleet buyer into Miami—where the U.S. arm is based—and walk through a modern parts warehouse and a modest call center, I suspect that lower price will suddenly look a lot better.

For more information, see www.ameraviainc.com or contact Mike McCann at 818-307-5607.

Avionics Shops: How You Might Choose

With the ADS-B mandate just 15 months away, now is the time to partner with a shop. Select one based on its ability to consult and communicate.

by Larry Anglisano

As we predicted a few years ago, the FAA's ADS-B equipage mandate is starting to create a scheduling backlog at many avionics shops. This won't lighten up and if you haven't equipped and plan to fly in ADS-B airspace, now is the time to get on a shop's schedule to at least plan the interface.

But if you don't have a relationship with an avionics shop you trust, selecting a good one is more involved than just scheduling. In this article we'll focus on some of the traits you should look for when qualifying a shop to do your avionics work. That's everything from ADS-B mods to major panel upgrades and repairs.

CAPABILITIES

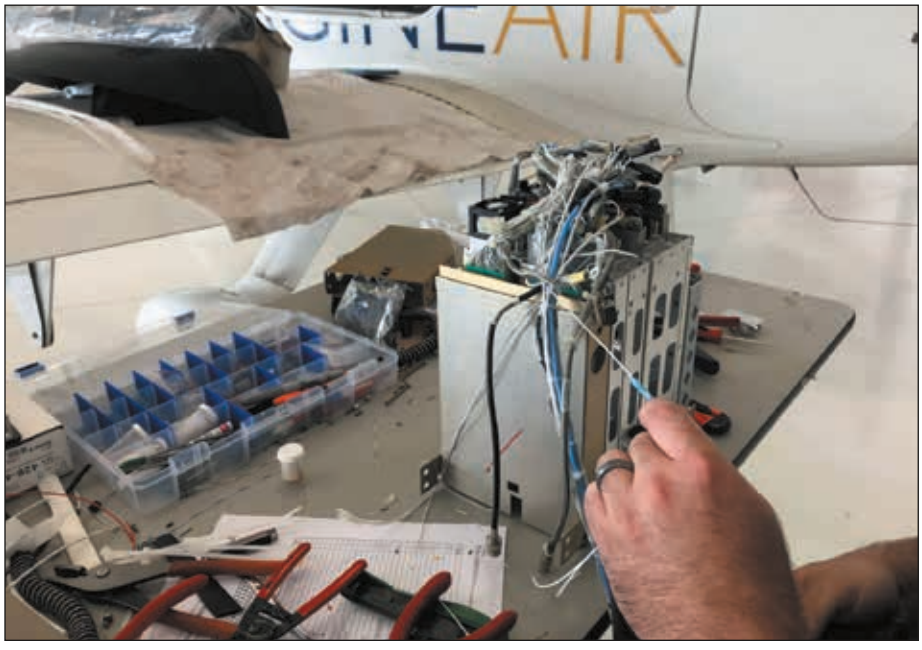
In our estimation, a lot of the smaller avionics shops have gone away over the past few years simply because they didn't have the competitive edge and the broad capabilities of larger ones. And by larger ones we mean shops that have a diverse staff, modern test equipment, bench repair capabilities, plus maintain dealerships for major brands.

You'll find that the majority of established avionics shops are Part 145 FAA repair stations, but some might have varying ops specs. For example, some might have instrument repair and overhaul capability, plus are spec'd to work on ship's weather radar, to name two major fields of expertise. One benefit of using a shop that maintains a Part 145 repair station is that it's required to have a quality control program in place (including an approved quality control manual), an area in which the FAA has placed sizable emphasis mostly for the right reasons.

Since the nature of modern avionics means deep interfaces with both the airframe and the engine, you should ask if the shop has experience working on your aircraft model. For example, if the installation requires adding or modifying antennas and your aircraft is composite or fabric (as opposed to metal), consider this specialty work that requires special skills. Not all shops can hang a new antenna on a Cirrus.

If the job includes adding an engine monitoring system with fuel totalizer, the shop will be installing temperature probes on the engine and working with the fuel delivery system. Ask if it has staff members who hold A&P certificates and are skilled with performing engine and fuel system mods. Some avionics shops might farm out this portion of the job to a maintenance shop—which is fine—but you should know who is doing the work and final testing.

Where it works should be a major consideration in choosing a shop. We've seen some small shops that don't have access to hangar space, but instead work outside on the ramp—clearly not the best approach. On the other hand, if the shop works in a community hangar where hangar pulls are done a few times a



Most avionics upgrades require custom wiring harnesses as shown in the main photo. Ask to see a sample because shops that are skilled in harness fabrication are proud to show off this work. The same goes for sheet metal work.

CHECKLIST

- Good shops offer several upgrade options, including multiple brands.
- Those same shops can lead you to the right training material.
- Many shops are starting to experience scheduling backlogs—even as long as one year.

day, hangar rash is a real possibility. We know of some otherwise nice hangars infested with birds and you know what that means. Ask to see the shop's workspace because it will provide clues to how your airplane will be cared for. Ask the shop if it carries hangar-keeper's insurance. Speaking of clues, one way to tell if a shop is organized is the manner in which it stores removed components. If you see interior pieces and removed avionics spread out on the floor around the airplane (instead of neatly organized on storage carts or shelves), it could reflect on the quality of the shop's work.

Ask to see a job in progress and make note of how the technicians are working. We cringe when we see tools sitting on unprotected seats and on the wings. To cover its hide, many shops will do a walk-around inspection of the aircraft to make note of paint scratches and interior flaws.

TRAINING AND FLIGHT TESTING

Those who work on the shop level understand loud and clear that major avionics installations are not finished until the aircraft is flight tested. But don't assume the shop will have flown the aircraft before you show up to bring it home. Some shops do have the qualified staff for flight testing, but they likely aren't efficient and current in every aircraft that shows up on the ramp. Ask if your aircraft will be flown, by whom and if the shop or pilot has the appropriate insurance to do so.

Don't assume that the aircraft will be ready to fly home once it's flight tested. It's not uncommon for there to be further tweaking that's required after the flight test. For that reason (and for regular support) we suggest working with a local shop within reasonable driving distance whenever it's possible because you could be making several visits during the project.

When deciding which shop will get the job, consider its approach to helping you learn how to use the new equipment. While avionics shops certainly are not in the flight training business (although some do employ flight instructors), ask how it can help tame the learning curve that tags along with modern equipment. Experienced shops know that you could be picking up a very different aircraft once the retrofit is completed. Cathy Rudd at Treasure Coast Avionics in Fort Pierce, Florida, stresses to her customers that they should be using all of the resources available to them while waiting for the aircraft to be finished.

The better shops invest big in modern and calibrated test equipment. That's a pitot static test set in the top photo. Engine monitor upgrades mean the shop will have its hands on your engine, middle and lower photos. Ask about its experience and qualifications to do so.

"Once the new equipment comes in, we'll give a customer the pilot's guides as homework while they wait, plus we introduce them to any free tablet-based trainers that exist," Rudd told us. We think that's the right approach because fumbling through the operation of new equipment during the flight testing part of the job is not what you want to be doing. Remember, the technician sitting shotgun on the flight is not tasked to give instruction. He or she will be sitting up straight in the seat on this flight, watching your every move.

As Rudd pointed out, many of the manufacturer-provided tablet- and smartphone-based simulators mimic the real equipment, made more realistic because of touchscreen interfaces. We've used the ones from Garmin (for the GTN series navigators) and from Avidyne (for the IFD series navigators) and found them to be a good learning resource when used in conjunction with pilot's guides. But those aren't the only resources.

"There are a lot of good YouTube-based training/tutorial videos that we direct our customers to," Rudd noted.

Rudd at Treasure Coast also takes the guidance one step further and often connects a new or potential customer with one who already has similar equipment installed. If you can go flying with someone who has the equipment, you'll have a better idea if this equipment is for you. Ask the shop for customer references.

Not all shops have in-house instrument repair capability. That's a gyro on a tilt table in the top photo. Ask where the shop is sourcing exchange components, if it isn't fixing them on its own. Metal panel work, middle, can add big to the bottom line. The pros have options. With bench repair capability dwindling, higher-volume shops keep an inventory of vintage exchange units, bottom.

Ones with happy customers will have no problem making the introduction.

PROPOSALS AND PAYMENT

Successful shops are the ones that nail price quotes before tearing into the aircraft. One sure way to agitate a customer is to hit him or her with major cost overruns halfway through the job. But the customer needs to step up and bring the aircraft to the shop for inspection before committing to the work. Emailing photos of the panel is a good way to get ballpark cost estimates, but the only way for a shop to make an accurate proposal is by inspecting the wiring and other systems (including antennas and circuit breakers) before preparing the quote.

Still, there are just some things a shop can't predict until the job gets rolling and it's fair to accept there could be some minor cost overruns. Ask what potential gotchas the shop might encounter. Experienced shops can pretty much tell what they'll be getting into when they inspect the aircraft and also look through the maintenance logbooks. They'll generally price a job with these snags in mind. For that reason, a price quote that's substantially lower than others (you should get at least three proposals for the same scope of work) should be a red flag.

Worth mentioning is payment terms. These are generally clearly spelled out on the proposal. If they aren't, ask the shop what it expects from you. It's just bad business for a shop to hand an aircraft back to the owner without first getting paid and good shops understand this.

As one shop manager who asked not to be identified described, time-consuming and costly payment disputes can be completely avoided if the shop spells out the terms and the customer follows them.

"I've been bitten one too many times by core customers who left on a handshake, promising they would mail me a check after they collected from their partner or after they moved some money. I ended up in court and won every case because I had terms in writing," he told us. Truth be told when it comes to getting paid, mechanics have sizable amounts of ammunition when the aircraft is in their possession, but once they let the aircraft go, it will take a trip to court to legally collect a debt. In general, the party that has possession of the aircraft has the advantage, but not always. We say do the right thing and pay the bill before leaving.

What are fair terms for the typical major avionics retrofit? It's not uncommon for shops to require half of the project cost when the job commences and the full balance at delivery. Understand that of all the challenges associated with running a shop, keeping on top of cash flow is the most difficult, especially at smaller shops. Think in terms of retrieving your vehicle from a dealer after repair. You won't get your keys back without paying the bill, and there's no saying it will be fixed. At least with an aircraft you might be able to flight test it to be sure it all works. Most shops warranty the wiring and workmanship indefinitely, but it's worth asking what's covered and for how long.

BE STRAIGHT

Customers don't like surprises, but neither do shops. Here's a scenario:

PUTTING OFF ADS-B MAY BE A BAD IDEA

We vividly remember when the FAA mandated Mode C altitude reporting equipment. Working with a shop located on the fringe of the New York TCA (now the New York Class B, of course) we witnessed a lot of airspace busts, with customers coming in waving FAA violation letters and needing proof that a shop remedied the equipage issue.

For at least a year after the mandate, it was a steady mess. There were plenty of altitude encoder installations (some requiring transponder bench mods) that got into the wrong hands, plus some aircraft that hadn't been upgraded yet, but still sailed through the TCA. So it was after recently waking up in a cold sweat with Mode C flashbacks, we thought it would be a good idea to beef up *Aviation Consumer's* field reporting on the installation/shop experience aspect of ADS-B upgrades. You know—spend some quality shop time with the folks on the front lines around the country (and in varying airspace) who actually put this stuff in. Our first stop was in coastal New England to NexAir Avionics, a popular shop on the fringe of the Boston Class B.

As we stuffed our camera lenses into the countless gutted airframes on NexAir's shop floor, it was obvious that putting off an ADS-B upgrade to the last minute—no matter how basic—will be a bad idea. There will be little sympathy. Brian Wolfe, the shop's avionics manager, makes it clear that his schedule is booking at least four months out. Other shops we talked with for this report, including the busy Sarasota Avionics, have similar if not longer backlogs. But for now it's still easy. In our estimation, these kinds of installation waiting lists will be a dream by mid-2019. And like most shops, NexAir and Sarasota, to name two, focus on more than just ADS-B upgrades. Its techs troubleshoot, do pitot static certifications, perform specialized maintenance and of course—the priority—do major avionics retrofits. We wouldn't expect high-volume shops to bump a $60,000 full-panel job from the schedule in favor of a $5000 ADS-B upgrade. Although, Nexair's owner, Dave Fetherston, told me he's committed to working with other shops as demand increases. That type of cooperative networking could be the only chance (slim, perhaps) for getting the fleet equipped in time for the mandate.

Some are predicting that shops will significantly raise labor rates because of the ADS-B crunch. In our view, that's not exactly price gouging because plenty of shops we've talked with say the only way to pump out the jobs is by working weekends and in some cases, multiple shifts.

It's not all doom and gloom. There are stone simple ADS-B systems that might be installed in less than an hour, as uAvionix boasts of its under-$2000 skyBeacon and tailBeacon bolt-on solutions, which are STC approved now. On the other hand, these are low-flying 978 UAT products. There are plenty of Part 25 (jet) airplanes that still need to be upgraded and shops will be scrambling to work on them, too. Where the typical piston or light twin might be down for three to five days for an ADS-B upgrade, a jet solution could take months to complete.

Last, we would allow some time to work out any technical bugs that might exist in the installation. A reader recently reported that his shop is going on month two troubleshooting a major interface that includes new ADS-B equipment and he's looking for a different shop to get it right. Who wants to be dealing with that 15 months from now when you need might need functioning ADS-B Out just to fly the aircraft off the field?

You've made a deal to have a Garmin GPS installed, which connects directly with an existing analog HSI and autopilot. For as long as you remember, the autopilot hasn't worked well with the current radio setup. Don't assume the new Garmin retrofit will fix the existing interface, and do tell the shop about it before it quotes the job. If you don't, your wallet could take a bigger hit at the tail end of the project when the aircraft is already reassembled, but now has to be taken apart again for troubleshooting.

Still, ask the shop if it will test the existing systems before starting the work. It should. One nuisance squawk that's common at the end of a job is faulty panel lighting. You were certain the instrument lighting worked the last time you flew at night, two years ago. Test the lights, note any problems and tell the shop. Retrofits are a good time to modernize the panel lighting and a detail-oriented shop should make suggestions.

YouTube See an ADS-B installation field report video at http://tinyurl.com/j95ht2a

WRAP IT UP

Shops tell us that most customers have a pretty good idea of what equipment they want before coming in the door, but sometimes it won't fit, it isn't compatible or simply blows the budget. Good shops have consultants (preferably pilots) who can help with alternative interfaces. This means offering multiple solutions, including used equipment. Be suspicious of a shop that pushes one brand of equipment. It's no secret that some manufacturers offer sales incentives based on volume. Also understand that avionics retrofits have a way of snowballing, by nature of their complexity. Find a shop that's willing to brainstorm and even work with you on the project, as reader Bob Reed described of the recent work done to his Grumman Tiger.

"After three major upgrades in the 18 years of owning this airplane, an aging GPS brought me back to Lancaster Avionics in Pennsylvania

for what started as a Garmin GTN650 install, but ultimately included dual G5 EFIS displays, a PS Engineering audio panel and major panel work," Reed told us. As most do, the major panel work came with FAA regulatory considerations.

"Two months ahead of the installation I sat in the plane with shop manager Todd Adams and while we agreed that a full-panel replacement would serve me best, the complexity of the structural modification was beyond what I wanted to tackle—or could afford," Reed said.

Reed ended up designing a hybrid panel (essentially a metal overlay) in AutoCad and had it laser cut by a machine shop and then powder coated. Retaining the original structure saved time and a lot of paperwork. Good shops should be experts with metal fabrication and painting, but you should ask to see sample panels.

Every shop we spoke with stressed that preparing the aircraft paperwork has become a major effort. Gone are the days of simply making a logbook entry and revising the weight and balance report. Now projects often require customized flight manual supplements, instructions for continued airworthiness and FAA 337 forms. Since you'll pay for this effort, ask the shop how much of the proposal accounts for paperwork. If an FAA field approval is required (which is essentially a one-time STC), the shop might not be able to predict what the effort will cost. Pressurized aircraft might require engineering approval, especially for antenna work.

Ask the shop if it has a DER (designated engineering representatives) on staff or will it hire an outside engineer to approve the technical data that chases the modification. This can add thousands of dollars to an installation.

Last, avionics require substantial programming and configuration—sometimes a full shop day's effort. Since not every interface is programmed the same, ask the shop if it will include wiring diagrams and configuration data that's specific to the interface. Keep this data with the aircraft in case another shop is faced with troubleshooting it.

In a future *Aviation Consumer* article we'll look closely at avionics training, including the specific courses offered by manufacturers.

TRAINING

Private Pilot Training: Accelerate It?

Accelerated flight training means the student forgets less between lessons and spends less time on review. We think it's a viable option for the private ticket.

by Rick Durden

When we've reported on accelerated flight training courses it's been for someone who already holds a pilot certificate and is adding on a rating. But what about the newcomer to the world of aviation who is eager to become a private pilot—is there an advantage to getting the rating via a full-immersion, accelerated course? If so, what's involved, what will it cost and how should the prospective student prepare for training?

Our, admittedly arbitrary, definition of "accelerated private pilot course" is one that is completed within a month. We surveyed a number of flight schools that offer such courses and spoke with some pilots who had completed one. Our conclusion is that, for a person who has the time, money and self-discipline to eat, sleep and breathe flying 8-12 hours a day for two or three weeks, an accelerated course is a better way to obtain a private pilot certificate than flying intermittently over the course of a few months or a year and costs about the same.

Immersion aviation training courses have been around since the Wright brothers opened up their flight school. It's the way the military and *ab initio* courses around the world operate. Accelerated courses work, in part, because the student wastes very little time on review during each flight because she or he hasn't had time to forget what was learned on the last one.

DEDICATED SCHOOL?

As we researched this article, we became convinced that unless the flight

If you decide to go through an accelerated private pilot flight training program, show up prepared to immerse yourself in aviation, without distractions.

Plan on at least 20 hours of ground instruction—we think it should be one-on-one tutoring, above. We think simulator time can be beneficial, below.

school had a plan in place for accelerated private pilot training as well as a track record of conducting it, getting the rating inside of a month probably isn't going to happen. Especially with the current instructor shortage, few flight schools have the resources for intensive training.

The military, *ab initio* and dedicated accelerated flight schools know that, impersonal as it is, there has to be an assembly line in place so that a raw student can be fed in one end, an instructor, training materials and airplane injected at the appropriate points to allow a private pilot to pop out of the other end in a matter of days.

That means going to a school that has a dedicated program in place. It also means that the customer/prospective private pilot can't expect to call up and schedule training to begin tomorrow. There is a lead time of at least a few weeks to allow the prospective pilot to not only clear the decks and probably also go through a private pilot written exam prep course and pass the written. On top of that, we think that the prospective pilot has to have a number of talks with the flight school—and, ideally, the instructor who is assigned to her or him—to go over what will be expected of the student and let the instructor get to know the student and begin to tailor the training for the student. Finally, because there is a serious shortage of Designated Pilot Examiners, the school has to schedule the checkride for the student weeks or months in advance.

SCHOOL RESPONSIBILITIES

After speaking with dedicated accelerated flight training schools and students who had completed accelerated courses we came to a number of conclusions as to what a prospective pilot should expect when selecting an accelerated training facility.

The school should be able to dedicate one instructor to the student either as the only or supervising instructor for the entire course. We think that continuity of instruction is vital.

The common comment we received from pilots who had received training in various accelerated environments was that, no matter the reputation of the training organization, the quality of the instructor assigned to the student makes all of the difference in the success of the training. In our opinion, that means that the instructor and student should have an opportunity to speak a number of times before training begins to root out any personality conflicts or "this just doesn't fit" situations before it's necessary to change instructors in the middle of training. It is also our firm opinion that if a problem between an instructor and a student does crop up during training, the school should be in a position to change instructors within a day.

A few of the accelerated private pilot training programs will come to the student (and use the student's airplane). For those, we think it is especially important that the student and instructor have communicated a number of times before the training starts because changing instructors is more difficult.

We think the school should dedicate one airplane to the student during the training program. While that means that the airplane may not be making as much money for the school as it might because it is sitting while the student is doing ground school, we think it helps the student to get to know an individual airplane, and its quirks.

We also think that there should not be pressure on the student and instructor to get the airplane back in time for the next student. Delays are common in aviation. If a flight, be it dual or solo, gets off to a late start, in our opinion, there should be no need to truncate that flight because another student is waiting for the airplane.

Airplanes break. Sometimes the fix takes a few minutes, sometimes it's days. In our opinion the school should be able to have a replacement airplane of the same type, with the same or similar avionics, on the line within an hour or two.

We like flight simulators. A qualifying one can be used for credit for 2.5 hours toward the private pilot rating, and can help the student learn and retain maneuvers, especially if weather interrupts training. We think that integrating a simulator into a program is a plus.

The syllabus for the program should be provided to the student well in advance. The student should easily be able to tell where he or she is as training progresses. The syllabus should have clear goals and objective completion standards for lessons.

Finally, all of the schools we

EARNING THE PRIVATE CERTIFICATE: WHAT'S INVOLVED?

The data we've been able to find on private pilot training consistently show that most students are able to obtain the rating with between 60 and 70 hours of flight time. The accelerated schools we spoke with said that the majority of their students get the rating in less than a month with 40-45 hours of flight time. We've seen students who totally immerse themselves in a solid learning environment get the rating with under 50 hours of flight time.

As part of our survey of accelerated flight training we took a step back and looked at what a person has to master to become a private pilot—you know, to become the *Pilot in Command* of an aircraft carrying passengers, operating in the National Airspace System. We were reminded that the material, at first blush, appears to be a mountain of stuff.

While most of the readers of this magazine hold at least a private pilot certificate, we think it's worth a review of what the FAA requires for the rating to remind those who hold it that what they did was pretty impressive and to let those who are considering the rating know what they are in for. The good news for those who are considering the rating and see what follows as an unclimbable mountain: We'll say up front that it's not and let you know a secret—those of us who obtained the private ratings are not super beings in any way, shape or form (just ask a pilot's spouse). We're being perfectly frank when we say: If we can do it, you can do it.

The FAA sets out the areas of aeronautical knowledge, risk management and flight proficiency required of a private pilot in FAR Part 61 and provides detailed guidance in a series of handbooks, known as the FAA-H-8083 series. Demonstration of proficiency is via a computer-graded test—commonly known as "the written"—and a practical examination with an FAA-designated examiner, which consists of two parts, a one-on-one oral exam and a demonstration of proficiency in an airplane—usually called either a flight test or checkride.

The FAA breaks down the areas of knowledge, risk management and skills to master in its Private Pilot Airman Certification Standards. The nearly 100-page document is available for free on the FAA website (www.faa.gov). Massively abbreviated, here's what a private pilot has to know and demonstrate.

Preflight preparation: pilot and medical certification requirements, limitations and privileges; aircraft airworthiness requirements and determining if an aircraft is airworthy; obtaining and interpreting weather applicable to a flight, weather minimums and making the ongoing "go-no go" decision during flight; cross-country VFR flight including aircraft performance and loading; operating in the National Airspace System and appropriate use of aircraft systems; human factors applicable to flight.

Takeoff and landing operations: engine starting and operating; airport surface ops on towered and non-towered fields; takeoffs and landings including rejected takeoffs, go-arounds, engine failure, dealing with different runway surfaces (short and soft) and crosswinds; stabilized approaches.

Maneuvering: steep turns; ground reference maneuvers; slow flight; stall recognition, avoidance and recovery power on and power off; and basic maneuvering with reference to instruments.

Navigation: reading and interpreting aeronautical charts and symbology; pilotage and dead reckoning; use of ground-based and satellite-based navigation systems; use of radar assistance to VFR aircraft; use of transponder; selecting an alternate destination in flight; complying with airspace regulations, communications requirements and weather minimums during cross-country flight; lost procedures and night operations.

Emergency operations: mastery of emergency procedures in the aircraft POH; emergency descent; forced landing; obtaining assistance from ATC and use of emergency equipment and survival gear.

Postflight procedures: after landing checklist; appropriate taxi operations and responding to signals from persons marshalling aircraft on a ramp; parking; systems and engine shutdown; securing the aircraft; postflight inspection and documentation of aircraft discrepancies.

You can do it.

contacted said that they will help students find cost-appropriate lodging near the school.

STUDENT RESPONSIBILITIES

While the school has responsibilities to the student, the student has responsibilities to him or herself and, by extension, to the school and instructor. The first is that the student be able to dedicate full time to the training. When we asked schools about students who have trouble completing training within the allotted time, all said that it was almost always that the student could not get rid of distractions.

Most of the schools we spoke with require that the student have passed the private pilot written exam prior to coming for training. For example,

Airplane condition matters. You're spending big money for training, you're entitled to an airplane that is in good shape. If it goes down for maintenance, the school should be able to provide a replacement of the same type with similar equipment and avionics on short notice.

Ocala Aviation Services (www.usflighttraining.com) requires that a customer "have taken or be prepared to take the FAA Written Knowledge test within two days of arriving at Ocala Aviation Services." Sporty's Pilot Academy (www.sportysacademy.com) requires that arriving students have passed the written.

According to Sporty's Ed Radtke, they prefer that the student have taken the training for the written using Sporty's materials as those tie in with the flight training syllabus, making the flight training go more smoothly.

Accelerated Flight & Instrument Training (www.afit-info.com) goes one step further in requiring that the student have received at least a score of 80 percent on the written. CEO Tony Montalte told us in the school's 30 years of business they'd observed that pilot examiners gave checkrides that were up to an hour longer to applicants with test scores below 80.

The only school we spoke with that did not require the arriving student to have passed the written was Air Trek North (www.airtreknorth.com). School owner Randy Schoephoerster told us that they have found that because of the difficulty for someone coming into aviation cold to get through the materials for the written and pass it without also flying, their three-week private pilot training course includes getting the student through the written exam.

Every school required that a student have passed at least the FAA third class medical and have a current medical certificate when they arrive for training.

COST

None of the schools we surveyed promised a "guaranteed" cost for its accelerated private pilot training course. We've seen "guaranteed" pricing for flight training and consider it bogus. The schools we spoke to all said that they realize that there are variables in the flight training process and the student and would give us either a base price or a price range. We note that training cost is significantly affected by the type of airplane used.

The lowest price we saw was at Air Trek North, which listed a base price of $6400 in a Cessna 150. Owner Randy Schoephoerster told us that younger students were more likely to get the private rating at the FAA minimum number of hours than older students and that his school had had a number of students who were ready for the checkride before reaching 40 hours.

Ocala Aviation Services quotes a base price of $10,575 for 45 hours in a Cessna 172. Ocala's Brad Broersma said that in the 15 years the company has offered the accelerated private program, the majority of the students have completed it in two weeks, working six days a week. He also said that, even in Florida, there can be weather delays in training, so students should come prepared to be flexible.

Ed Radtke of Sporty's Pilot Academy quoted a price range for its accelerated course in a Cessna 172, from $10,000 to $12,000. He said that prospective students should plan on a three-month lead time between first contacting Sporty's and beginning the course. He told us that demand for accelerated courses is so high that the Academy won't be able to take a new student until next spring.

PAYING FOR IT

No matter how you intend to pay for an accelerated training program, we cannot overemphasize our recommendation that you not pay more than $1000 up front. We've seen way too many schools require advance payments for half or all of the training and then vanish before the student finishes. We once thought that aviation only attracted the most honest of humans. We were long ago disabused of that notion.

Some schools require a deposit before starting training. We recognize that the school incurs some costs in getting ready for a student and a cancellation can put an unfillable hole in the schedule—possibly a significant loss.

The schools we surveyed said they will help students get financing for training. We recommend that you not use a financing organization that is connected directly with the school—stick with a reputable third party and maintain control of when the money goes to the school. Air Trek North's Schoephoerster told us that he recommends AOPA financing because "Even if they say no, they do so gently."

Because of the interest rate on credit cards we strongly recommend against using them for financing.

CONCLUSION

If you are the type of person who can take two or three weeks away from life and are willing to work hard all day, each day of those two weeks, we think an accelerated private pilot training course may be the ideal way to get the rating.

Rescue Beacons: ResQLink+ Gets The Nod

The Personal Locator Beacon market has never been more competitive. The ResQLink+ is our favorite among plenty of good, affordable choices.

by Rick Durden

As pilots, we long ago learned that once we point the nose of our aircraft away from metropolitan areas it is often only minutes before we are over terrain that is sparsely populated at best. West of the Mississippi or over the Alleghenies, it's not unusual for much of our flight time to be over what seems to be miles and miles of nothing but miles and miles.

That's what makes investing in a personal locator beacon, or PLB, an easy decision as a belt-and-suspenders backup for the aircraft's ELT. Plus, if you survive the ditching in the boonies, you can take a PLB with you should you have to hike.

But if you haven't shopped the PLB market in a while, the latest tech can be confusing so we rounded up a handful of models to see which were among the best value. Here's a report.

WE'RE ALWAYS LISTENING

Bluntly, when it comes to successful SAR (search and rescue) for someone in distress in the toolies, the pros who are listening for distress calls and have the resources to come get you are doing so via satellite-based 406 MHz receiving equipment.

Relying on a 121.5-only transmitter in an emergency may just give you the answer to the question as to whether a tree falling in the woods without anyone hearing it makes any noise.

We've observed that a significant portion of the aircraft rental fleet in the country is still equipped with 121.5 MHz-only ELTs. If you're a pilot who either has no access to an aircraft with a 406 MHz ELT or does, and wants a backup device because you recognize that an ELT may not trigger, its signal may be blocked due to the dynamics of an accident or the ELT can sink with the aircraft, what are your alternatives?

It's easy; buy a PLB. It easily fits in the pocket of your survival vest. It transmits on 406 MHz and 121.5 MHz. It's less than half the price of an ELT. It doesn't require a paying for an ongoing subscription for it to work (I keep thinking of the folks who have an accident shortly after forgetting to renew their insurance).

If you don't have a PLB, we think now is a good time to buy. As we'll talk about in a moment, the selection is excellent and the prices are reasonable.

BUY AND FORGET

A PLB is pretty much "buy and forget." Once you buy it, you go through a one-time, free registration procedure via the internet (www.beaconregistration.noaa.gov) so that if it's triggered the SAR folks can call you to see if it's a false alarm. You then stick it in your survival vest. (You do have a survival vest? See the February 2015 issue of *Aviation Consumer*—you want your most important survival equipment with you when you get out of the airplane.)

Once the PLB's in your vest, it becomes one of the things you check

Left, you're down. Everyone survived but there are serious injuries. Now to get rescued; but the airplane only has a 121.5 MHz ELT so whether someone will hear it is problematic. That's where an inexpensive PLB such as the McMurdo Fast Find 220, above, could mean the difference between life and death.

Above, from left to right: ACR AquaLink, ResQLink+ and AquaLink View. McMurdo Fast Find Max G, below.

during your inventory of your vest as one of the things that pops up on your aviation calendar every six months—inventory the survival vest and take recurrent flight training (you do that, too, right?). During that inventory, you check the ELT battery. If it's still good, you put it back in the vest. It should last six to nine years. Once it's slipped its mortal coil you check to see if it's cheaper to send the PLB in for a battery replacement or buy a new unit—to date it's generally been cheaper to buy a new PLB and 86 the old one.

While some PLBs are capable of sending messages—an option that requires a subscription—a PLB is *not* a communication device; it is purely designed to let SAR know that you need help and guide rescuers to you. Before making a PLB purchase, you need to decide whether you want a communicator or a dedicated life-saving device for which you do not have to make ongoing payments.

HOW SAR WORKS

When you activate a PLB, it transmits a powerful signal at 406 MHz, an internationally recognized distress frequency monitored in the U.S. by the National Oceanic and Atmospheric Administration (NOAA), the Air Force Rescue Coordination Center (AFRCC) and the United States Coast Guard (USCG). The signal is sent to a network of U.S., Russian, Canadian and French weather and global navigation system satellites that are part of the COSPAS-SARSAT international satellite-based search and rescue system (SARSAT is an acronym for "Search and Rescue Satellite Aided Tracking").

The international COSPAS-SARSAT system is based on a network of satellites in low-altitude earth and geostationary orbit as well as ground receiving stations and control and coordination centers. Its mission is to provide accurate and reliable distress alert and homing data. Since its launch in 1985, the COSPAS-SARSAT system has helped save more than 26,000 lives.

When activated, a PLB sends two signals: 406 MHz (which carries the unit's unique identifying number—UIN—and GPS data to the satellites) and 121.5 MHz. SAR operations then comprise three steps: alert, homing and rescue. The alert and homing phases used the same 121.5 MHz analog frequency up until 2009, when COSPAS-SARSAT decided that it would phase out satellite processing at the 121.5 MHz frequency and that alerts would be triggered only on 406 MHz, digital frequency able to offer enhanced security, to provide more comprehensive information and to reduce the number of false alarms.

After receiving your transmission, the satellites "fix" on your location using frequency of arrival (FOA) and time of arrival (TOA) methods, then relay your information to the AFRCC or the USCG depending on

SELECT PERSONAL LOCATOR BEACONS COMPARED

DEVICE	SIZE AND WEIGHT	FEATURES	STREET PRICE
ACR ResQLink ACR ResQLink+ ACR AquaLink ACR AquaLink View	1.3 x 1.9 x 3.9 inches. 4.6 ounces. 1.6 x 1.9 x 4.5 inches. 5.4 ounces. 2.3 x 5.8 x 1.45 inches. 9.2 ounces. 2.3 x 5.8 x 1.45 inches. 9.2 ounces	GPS, strobe, class 2 battery GPS, strobe, floats, class 2 battery GPS, strobe, floats, class 2 battery GPS, strobe, floats, class 2 battery, view screen	$244 $243 $325 $360
McMurdo Fast Find 220 McMurdo Fast Find Max G	4 x 1.8 x 1.3 inches. 8 ounces. 5.7 x 3 x 1.3 inches. 9 ounces.	GPS, strobe, class 2 battery GPS, no strobe, floats, class 2 battery, 48-hour transmit time, user-replaceable battery pack	$246 $487
Artex	3 x 2.1 x 1.3 inches. 4.9 ounces.	GPS, strobe, class 2 battery	$269
RescueME PLB 1	3 x 2.1 x 1.3 inches. 4.2 ounces	GPS, strobe, class 2 battery	$249
Breitling Emergency Watch	0.85 inches thick, 2 inches diameter. 5 ounces (without watch strap).	Integral to a watch, category 2 rechargeable battery	$16,000

the location of your alert. If you use a GPS-compatible PLB, it can deliver your GPS coordinates (within less than 100 meters) to SAR personnel through the satellite system. This information is passed on to local SAR authorities who will come to your assistance.

Even without GPS, the 406 MHz signal from the satellite will get rescuers to within five kilometers of your position. Then search-and-rescue teams will use a tracking device to home in on the 121.5 MHz and the 406 MHz frequencies.

Many PLBs include a built-in LED signal light to help rescuers find you once they get close.

REGISTRATION

Federal law requires that all PLBs be registered in the NOAA SARSAT database. Registering your device is free of charge and the data is protected and only shared with rescue forces when your PLB is activated. When you register, NOAA will link your essential personal information to a 15-character code known as a Unique Identifying Number (UIN). When activated, the PLB transmits your UIN to the COSPAS-SARSAT satellites via electronic bursts.

While the electronic bursts provide search-and-rescue units with your location, the UIN tells them personal information such as your name, address, phone number and any medical conditions you may have.

TRANSMISSION TIME

A PLB comes equipped with a lithium battery that remains dormant until you activate the PLB. By COSPAS-SARSAT regulations there are two classes of PLBs, based on battery capability: Class 1—the heavy-duty battery must be able to transmit at -40°F (-40°C) for 24 hours. Class 2—the battery must be able to transmit at -20°F (-28.9°C) for 24 hours.

A PLB must be certified by COSPAS-SARSAT and the FCC before it can be sold in the U.S. That COSPAS-SARSAT certification process, including lab testing, is a big deal; it typically takes a year or more. Human lives depend on PLBs.

With all that as background, we surveyed the market to see what's available and what we'd like to have. We'll note here that most of the PLBs we surveyed are water resistant/proof to some degree, but few of them float unless they are in a buoyancy pouch—and none will transmit from inside the pouch.

Finally, because you may have only one working hand following an accident, it is our opinion that any PLB you purchase should be capable of single-handed activation. All that we reviewed were capable of one-hand activation, although some were easier than others.

COBHAM/ACR

A long-established beacon company, Cobham (www.cobham.com), and its subsidiary ACR, put out four PLBs, all with Category 2 batteries, that vary only in size and features. All have an identical activation procedure: Deploy the antenna, press the "on" button and give the antenna a clear view of the sky. All models recommend battery replacement within six years of manufacture or five years of being placed in service (and immediately after being activated) and come with five-year warranties. All are waterproof to 16 feet.

- At 4.6 ounces, the **ResQLink** is a more than adequate PLB that includes an internal GPS. It does not float. It is one of the smallest, lightest PLBs on the market. Our search revealed prices as low as $244. A floatation pouch is available for separate purchase for about $20. A built-in strobe comes on when the unit is activated.

In its stowed position, the antenna wraps around the body of the unit. Unclipping it is not intuitive; we had to watch a video to determine how to do it. Once we figured it out, it was easy to do one-handed.

- ACR's **ResQLink+** weighs 5.4 ounces and differs from the basic ResQLink only in that it floats. Interestingly, we found it on Amazon for a dollar less than the non-bouyant unit—$243.

While it floats, the ResQLink+ floats face down, so it's not possible to let the device bob along beside you in the water while it's transmitting. You've got to get it onto a surface where the face of the unit is pointed at the sky and the antenna is clear of the water.

- ACR's **AquaLink** is a larger version of the ResQLink line that floats. It also has the antenna wrapped around the body when stowed, but we think deployment of the antenna is slightly more user friendly and may be less likely to frustrate a pas-

Artex, above left, is nearly identical in form and function to the RescueME PLB 1, above right. Below, the Breitling Emergency is a watch with a full-functioning, non-GPS PLB inside. The antennas extend from each side of the lower portion of the watch—the right antenna is behind the cap on the right side of the case just below the center of the photo.

senger who hasn't been briefed on its operation. It also can be deployed one-handed.

We found street prices as low as $325 for the AquaLink; however, we do not feel that it has any features beyond those of the ResQLink+ and saw no reason to spend the extra money.

• ACR's **AquaLink View** PLB takes the AquaLink one step up by incorporating a digital display that allows you to monitor the beacon's operational activities and displays your lat/long. It also displays operating instructions for the unit.

The AquaLink View will allow you to send "I'm OK" messages via a subscription service. It also walks the user through the unit's self-testing procedure. We saw street prices as low as $360.

MCMURDO

The McMurdo (www.mcmurdogroup.com) **Fast Find 220** comes close to the ResQLink in the race for smallest PLB and costs about the same. It does not float, so it requires the floatation pouch that comes with the unit for buoyancy. We saw street prices as low as $246.

Activation involves pulling a tab and removing the top of the unit. The antenna unfurls either by itself or with a nudge by the user. With the Fast Find on its back, the antenna points directly upward. All that is left to do is press the "on" button. Activation can be carried out with one hand.

Battery life is advertised as six years; however, when preparing this article we ran the battery test on the Fast Find we purchased more than nine years ago and it checked fine.

The **Fast Find Max G** is essentially a bulked-up 220—having the same features but enclosed in what is described as a shatterproof case, it floats and will transmit for 48 hours rather than the 24 hours promised by all the other PLBs we surveyed. On the plus side, the unit has a user-replaceable battery pack, something we have not seen with other PLBs. We found street prices as low as $487. Unless you need a PLB that will probably withstand greater impact forces than you or you require twice the transmission time of a standard PLB, we would stick with a lower-priced unit.

ARTEX

The **Artex** (www.acrartex.com) PLB is also one of the very smallest we reviewed. The activation procedure is claimed to be one-handed, although you have to wedge the unit against something as you pull the antenna out of the body. After that, you flip open the flap to uncover the "on" button and press the button.

As with the smallest of PLBs, the Artex does not float, but it has an attractive street price—we saw as low as $269 at Aircraft Spruce (www.aircraftspruce.com).

OCEAN SIGNAL

At 4.2 ounces, Ocean Signal's **RescueME PLB 1** takes the title of the smallest PLB. Its appearance is nearly identical to that of the Artex unit, including the same activation procedure. Battery life is advertised as seven years. The street price we observed, $249, is also attractive.

As with most other units, the RescueME floats only with a floatation pouch and will not transmit from within the pouch.

BREITLING EMERGENCY

There is one PLB that is ordinarily worn rather than being carried in a pocket or emergency vest. It's a part of one of the more expensive wristwatches on the market, the **Breitling Emergency**.

At a street price of $16,000, give or take a few hundred bucks, the market for the Emergency is, according to Breitling (www.breitling.com), limited. However, the PLB portion of the watch is no joke—Breitling went through a staggeringly expensive R&D process to miniaturize a PLB and an antenna suite, create a rechargeable battery (every few months in a dedicated charger) and then go through the certification process in a number of countries. It does not have a GPS.

As we researched this article, we

learned that if you own a PLB and travel to a country where that make is not certified for sale and you have an emergency and trigger it, you will not be refused rescue.

In our opinion, Breitling's Emergency PLB watch is not a gimmick. On the market in the U.S. since 2015, there are reports of users in life-threatening situations triggering the PLB and being rescued.

The antenna system of the Emergency has two extendable sections housed in the lower part of the watch. They are extended by unscrewing the cap on the right side of the watch. The cap comes free as the antenna deploys. Activation is one-handed only, in our opinion, if the wearer can use the hand on the arm not wearing the watch.

The transmitter transmits alternately on 121.5 and 406 MHz in a fashion that automatically uses the portion of the antenna length as required for the wavelength of the transmission.

A notable part of the development of the Emergency was a tiny battery that could support the power output demands of the alternating radio frequency transmissions—30 mW for 121.5 MHz and more than 100 times higher for 406 MHz: 3.2 W.

CONCLUSION

We think a PLB is cheap insurance for anyone who flies over even slightly remote areas. If the pilot also engages in hiking, boating or other sports that take her or him away from civilization it's an additional reason to own a PLB.

Due to the rigorous certification process, we are of the opinion that you won't go wrong with any of the GPS-equipped ones we surveyed. Because we keep our PLB in our survival vest, size and weight matter. We prefer small and light—and at well under a pound, most of them fall within our operating definition of "lightweight." By the same token, if you're also in the market for a seriously high-end timepiece, we think buying one with an integral PLB, even without GPS, makes sense.

While we don't think you'll go wrong with any of the GPS-equipped PLBs, we lean toward the ResQLink+, just because it is not only waterproof, it floats without needing to be stuffed inside a pouch.

Garmin GMA345: Slide-and-Fly Audio Panel

A drop-in replacement for Garmin's first-gen GMA340, the GMA345 has Bluetooth, USB power and a rich entertainment feature set.

by Larry Anglisano

When we reviewed the Garmin GMA340 audio panel in the November 1999 *Aviation Consumer*, we liked its utilitarian feature set and robust controls. It was a huge success. Garmin populated the market with GMA340s in big numbers through OEM and retrofit sales, often paired with GNS430/530 systems. If you have this pairing you might think twice about upgrading because it simply works.

But for Bluetooth and a deeper audio interface, Garmin offers the $1895 GMA345. It uses the existing GMA340 wiring, which all but eliminates any installation effort.

To get a feel for the user experience and how it compares to the GMA340, we put a GMA345 on the test bench, cranked up the headsets and prepared this bench report.

ERGOS AND INTERCOM

The GMA345 is the same size as the legacy GMA340, measuring 6.3 by 1.33 by 8.09 inches and weighing 1.78 pounds with the installation hardware. Like the GMA340, the GMA345 supports up to six positions for its voice-activated stereo intercom. The requirements are the same as with any stereo intercom: You'll need stereo audio jacks and of course a stereo headset if you want true left- and right- channel separation.

CHECKLIST

- If you enjoy music on the fly, the GMA345 betters the aging GMA340.
- Overall, the audio quality is good and the user controls are rugged.
- Only one Bluetooth device at a time can be paired.

This is a worth a few words, as we often get questions about stereo interfaces with monaural headsets. Using a monaural headset in a stereo jack shorts the right headset channel output to ground. It doesn't damage the audio panel or the headsets, but plug in with a monaural headset and you'll hear the left channel in both ears. If a monaural headset is used at one of the passenger positions, any other passenger using a stereo headset hears audio in the left ear only. Ask your installer about your setup.

The GMA345 uses the same rugged push-button function keys that worked well on the GMA340. In our view, Garmin nailed the build quality again on the GMA345. When a key is selected, a green annunciator shows that the function is active and its brightness is controlled with a photocell. The key lighting is controlled by the aircraft's dimmer circuit.

The panel retains the setting used when it was last powered off and the left inner rotary knob serves double duty as an on/off control and pilot intercom volume control. The left outer knob controls the pilot's music volume. On the other side of the bezel, the inner knob controls the copilot and passenger intercom volume, while the right outer knob controls the copilot and passenger music volume. We like having these music volume controls easily accessible.

The standard panel supports two VHF comm radios, two nav radios and a telephone input, but Garmin also offers a three-comm version. The split-com mode (depressing both MIC keys at the same time) enables the pilot and copilot to transmit simultaneously over separate radios. If this feature is important to you, ask your shop if the existing comm antenna configuration will allow it to work right because there needs to be adequate distance between the two to avoid interference. You'll know when you're transmitting because the appropriate transceiver key annunciator flashes once per second. In split mode, both transceiver keys will flash.

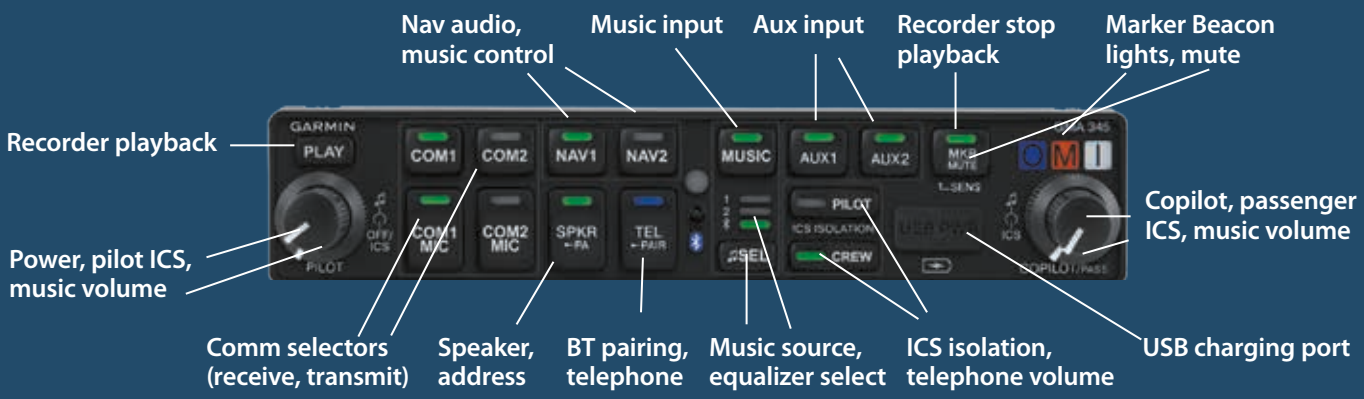
Just like the GMA340 it replaces, we think the GMA345 has a rugged control set, top. The two interface connectors are compatible with the GMA340 wiring, middle. We bench tested the panel with a Bose A20 headset and found the audio quality to be flawless (bottom), as it was in an older Cirrus with OEM GMA340 wiring.

BLUETOOTH AND MUSIC

One of the primary reasons for upgrading is to pair the audio panel with a smartphone or tablet, but the GMA345 only pairs to one device at a time. That means if you want to pair your smartphone for tunes and your iPad for app audio you can't do it. The panel does have two separate wired music inputs.

The GMA345 supports the A2DP Bluetooth profile for entertainment audio input (and AVCRP for advanced audio controls like play/pause, skip forward/previous), plus the HFP Bluetooth for connecting a telephone. When the telephone is connected, you talk in full duplex through the headset. To pair a device, press and hold the Pair key (co-located on the TEL key) for one second and a "pairing enabled" message is heard. The panel remembers the last 10 paired devices and whenever one is paired the Bluetooth annunciator on the panel remains lit to let you know it's connected. The TEL key flashes when there's an incoming call and you answer the call by pressing the key. Press it again to hang up. To

GMA345 CONTROL SET



initiate a call, press the TEL key and dial the number from your phone.

The panel has Bluetooth telephone volume controls, but like many of the advanced functions they're shared with other function keys. For example, press and hold the Pilot key (a control that's used for isolating the pilot on the intercom) to increase the call volume and the Crew key to decrease it. Without reading the manual, you wouldn't know these controls even exist. Similarly, pressing the Nav2 and Music keys simultaneously is how you play and pause the Bluetooth media. The Nav2 and AUX1 keys are used to skip the previous music track.

These examples are why we think the panel can benefit from a function display, similar to what PS Engineering has on its flagship PMA450B audio panel—not just for playing music, but also for working with other advanced functions. The MUSIC key selects/deselects the music input, while the SEL key selects either the two available wired music inputs or the Bluetooth input.

The pilot can choose not to hear music by selecting the pilot isolation function (selected with a dedicated key), but the copilot and passengers will still hear it.

Garmin takes the entertainment feature set one step further with the MusicEqualizer function. Press the SEL and PILOT bezel keys simultaneously to change the music equalizer setting from none to classical, pop or rock. There's also Music Bass Boost, which enhances the low-end frequency characteristics. The settings are none, medium and high boost.

And since it's easy to miss radio calls when jamming to tunes, the music can be muted—or not—triggered by either intercom chatter or radio activity. The function is easy to get to, as it should be, by pressing the MUSIC key for one second to mute the music when the comm radios open squelch. Doing the same with the AUX2 button mutes the music when passengers are active on the intercom. Aural messages "radio mute music enabled/disabled" and "intercom mute music enable/disabled" confirm the selections.

With a built-in 60-second digital clearance recorder, there should be no reason to botch read-backs. It records the selected comm radio (in separate memory blocks) and you play it back using the PLAY key. Once the 60 seconds of storage is spent, the system records over the memory blocks, starting from the oldest one. Toggle through the stored recordings by subsequently pressing the PLAY key. To stop the playback, press the MRK/MUTE key. Again, the function has nothing to do with the marker beacons, but that's where Garmin put the control. We think Garmin should offer a version without a marker beacon receiver and lights and add more dedicated bezel keys in its place.

3D AUDIO

Don't mistake the 3D Audio feature with the Telligence Voice Command feature in Garmin's GMA350C/GTN750 navigator interface. The 3D Audio processing creates an illusion that each selected audio source is coming from a unique location or seat position in the cabin. You'll need a stereo headset and stereo audio jacks for the separation function to work.

When both comm radios are selected for receiving, the primary comm is heard in the 11 o'clock position and the secondary comm is heard in the 1 o'clock position in the headset. If there's a single comm radio, it's heard in the 12 o'clock position. By default, the system assumes the pilot is sitting in the left seat, but this can be changed in the configuration settings.

We like that the 3D Audio feature can be turned off by pressing and holding the PILOT bezel key. An aural message is heard in the headset when the function is enabled.

WIRED INPUTS AND CUSTOM CONFIGURATION

The GMA345 supports up to four unswitched audio inputs. The Bluetooth feature set in the GMA345 works with later Garmin VIRB action cameras, including the XE and Ultra series, plus some GoPro models. Once paired, the pilot's headphone audio is sent to the camera for recording. Need to charge the camera or any other USB device? Plug it into the panel's Type A USB

power port. It outputs 2.1 amps of charging current.

BIG STEP UP

We think the GMA345 is a sizable jump in technology from the first-gen GMA340. One example is Garmin's Avionics Squelch (ASQ) feature, which filters out background hiss and some of the noise that's inherent with VHF comm radios. In a side-by-side listening evaluation, the GMA345's audio signature easily outperformed the GMA340. Still, the audio quality of any audio system depends on too many factors to list, most importantly the interface wiring and the health of the aircraft's charging system.

Another reason to step up might be for the GMA345's three auxiliary switched inputs, missing on the GMA340. Potential interfaces might include traffic and terrain systems, engine monitors and gear warning systems. The AUX1 key doubles up on inputs one and three and AUX2 is the secondary input.

Each installation can be customized via an eight-position DIP switch on the side of the chassis. Here an installer can fine tune the interface by setting whether the pilot's position is in the right or left seat, for passengers to hear the second entertainment input source as default and whether the monitored comm radio is muted during transmissions.

Having been involved in enough audio installations, perhaps what we like the best is the panel's installation diagnostic capability. By holding the PLAY button for more than five seconds, the unit flags an installation fault (like a shorted audio jack or software problem) using the bezel annunciators. That's a huge troubleshooting timesaver for the installer.

Garmin also offers the $1695 GMA342, a version without Bluetooth, but we think the $200 difference for the GMA345 is a no-brainer.

As a final thought, we think before buying any audio panel you should ask your shop for a hands-on demo. It should include PS Engineering's $2100 PMA8000G and also the flagship PMA450B, a panel we reviewed favorably in the July 2018 *Aviation Consumer*. There's also the Garmin GMA35/350C, which has a rich interface with Garmin's GTN750 navigator. Try them before you buy them to see which one you prefer.

Major Alterations: Get The Right Paperwork

Even if a major repair or alteration is performed by a qualified technician or shop, the work might not be considered airworthy per the regs.

Staff report

Own an aircraft for long enough and you'll eventually be faced with a modification or repair that's considered a major alteration. In FAA speak, that's an official term and a big deal that almost always requires more than a logbook entry for returning the aircraft to service.

In a regulatory climate that's been somewhat relaxing (especially in the avionics market) one of the most common and difficult questions to answer is whether a given repair or modification needs a special signoff. If you attempt to interpret the regulations, the requirements are more than paperwork. The two pertinent FARs involved are Appendix A to Part 43, which defines major repairs and alterations, and Appendix B to Part 43, which covers the recording of those major repairs and alterations.

Appendix A to Part 43 is extensive and covers major alterations to specific parts of the aircraft "when not listed in the aircraft's specifications issued by the FAA." Appendix A should be bookmarked because not only is it a starting point to determine if a given repair or mod is a major or minor alteration, it also covers owner-performed preventive maintenance. But for guidance on signing the work off, look to Appendix B because it deals specifically with the paperwork side.

For owner-performed major mods, it's possible to bring the aircraft to a general aircraft repair shop (or even complete the work at the shop under its supervision) where an IA can inspect the work and sign off the required FAA Form 337. It's not uncommon for IAs to sign off work done by A&P mechanics and even people who don't have a certificate. But in doing so, the IA is certifying that the proper data, required tools and testing procedures were used to complete the modification. The potential gotcha is that few general shops have the kind of specialized equipment to do most major repairs by the book since it could include special tools, special jigs and special test equipment. We know plenty of cases where a designated engineering representative (DER) had to get involved because insufficient data was available—not uncommon on rare and vintage aircraft, for example. That generally costs thousands of dollars and you want to avoid that trap by doing the research before cracking a wrench.

For repairs, you might find more signing capability at a Part 145 repair station because the signed shop work order can often serve as the recording medium spelled out in Appendix B of Part 43. Still, not all Part 145 repair stations can do all major repairs under the Part 145 banner, but only those for which they have been approved by category. Still, a Part 145 shop has more latitude since they have been more carefully inspected by the FAA, and have training programs and written procedures and other requirements in place to assure quality work. Some repair stations even have special FAA approval to use methods and materials unique to their operation that the FAA feels is equal to or better than the factory manual method or parts.

Last, don't underestimate the importance of having the proper paperwork to chase a major mod or repair because it could bite you when it comes time to sell the airplane. Supporting documentation—or the lack of—can make or break a deal.

Piper/Ted Smith Aerostar

An Aerostar has blistering speed and jet-like handling, but bring your A-game and be ready for intensive maintenance.

There's a lot to like about a Piper/Smith Aerostar. As piston twins go, the airplane has decent ramp appeal and passengers generally don't complain about its cabin dwelling. Fly one and you'll see why it has a rep for being blazingly fast, while demanding a healthy amount of pilot proficiency. Still, the aircraft has enough power to climb well on a single engine—something that can't be said for many other piston twins.

But be ready to feed the machine, as the saying goes. The airplane's Lycomings don't exactly sip fuel and although it's not terribly complex, the Aerostar fleet is aging and getting expensive to maintain. But for owners who can afford it, an Aerostar is hard to beat for getting from A to B faster than anything that doesn't burn Jet A.

The Aerostar is the product of famed aircraft designer Ted Smith, whose name is attached to such classics as the A-20 twin-engine bomber and the Twin and Jet Commander lines. In 1963, Smith formed his own company to build a family of fast fliers, all built around the same fuselage, wings and tail. Five years later, the Model 600 emerged in 1968, with normally aspirated Lycoming IO-540 engines and a takeoff weight of 5500 pounds. A year later, the 601 appeared, with a pair of Rajay turbochargers and manually controlled, electrically actuated wastegates on each engine. With turbos, the engines could maintain 290 HP from sea level to 16,000 feet.

If you want to go fast, look no further than an Aerostar.

SELLING OUT

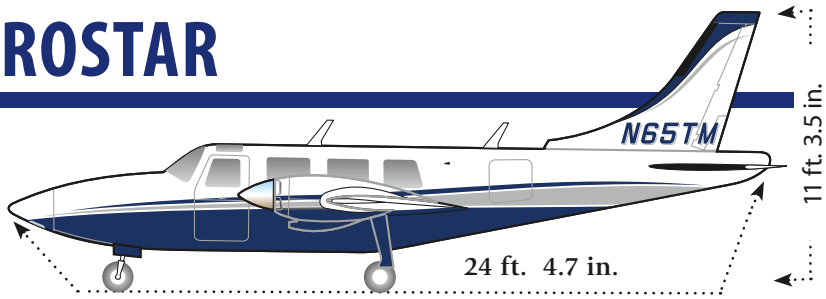
By this point, Smith had sold out, first to American Cement and later to Butler Aviation, which acquired both Aerostar and Mooney and moved them to Kerrville, Texas. A squabble between the new owner and the old over corrosion idled the line for two years. Unwilling to let his idea wither, Ted Smith organized a group of investors and bought the company back, setting it up in Santa Maria, California. The new company began building the 600A and 601A in 1973. The A models had Lycomings with heavier crankcases and crankshafts and engine TBO was boosted from 1400 hours to 2000 for the 600A and 1800 hours for the 601A.

The first pressurized Aerostar, the 601P, appeared in 1974, with a max differential pressure of 4.25 PSI, good for an 11,000-foot cabin all the way to 25,000 feet. The tenth 601P emerged with a longer wing (stretched from 34.2 to 36.7 feet) and higher max takeoff weight, 6000 pounds. These changes were incorporated in the unpressurized turbo model in 1977. The engines on the new B-model 601 were fitted with an automatic wastegate control, dumping the electric version.

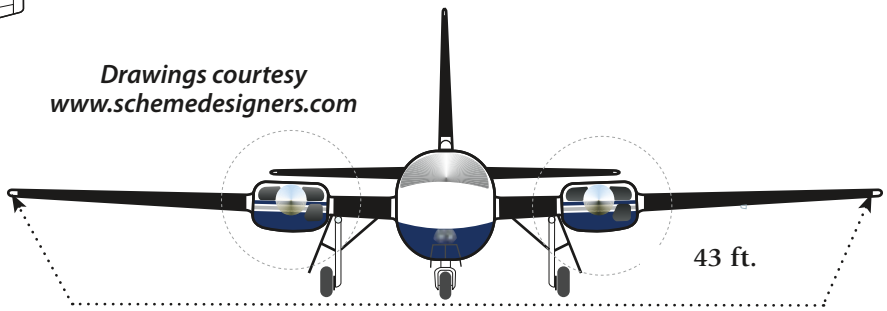
Ted Smith died in 1978 at 70 years of age, after open-heart surgery.

Peter Jensen chose his 1978 Smith Aerostar, main photo, over a Cessna 340 and has never looked back.

PIPER/TED SMITH AEROSTAR



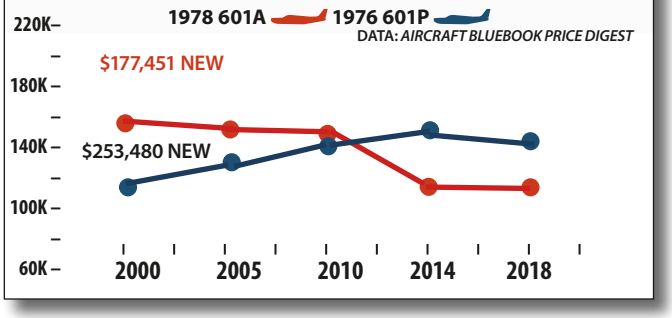
Drawings courtesy www.schemedesigners.com



PIPER/TED SMITH AEROSTAR MODEL HISTORY

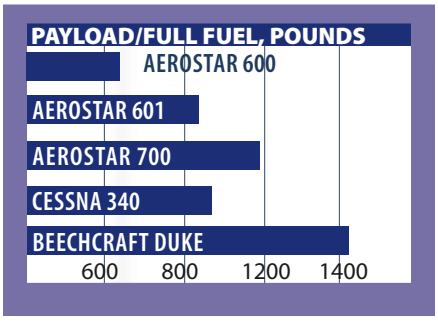
MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1969-70 AEROSTAR 600	LYC 290-HP IO-540-G1B5	1400	$40,000	165	1965 LBS	211 KTS	±$63,500
1973-75 AEROSTAR 600A	LYC 290-HP IO-540-K1F5	2000	$40,000	165	1965 LBS	211 KTS	±$80,000
1976-78 AEROSTAR 600A	LYC 290-HP IO-540-K1F5	2000	$40,000	165	1965 LBS	211 KTS	±$95,000
1979-81 AEROSTAR 600A	LYC 290-HP IO-540-K1J5	2000	$38,000	165	1965 LBS	211 KTS	±$108,000
1969-70 AEROSTAR 601	LYC 290-HP IO-540-P1A5	1600	$40,000	165	1970 LBS	237 KTS	±$68,000
1973-76 AEROSTAR 601A	LYC 290-HP IO-540-S1A5	1800	$40,000	165	1970 LBS	237 KTS	±$90,000
1977-78 AEROSTAR 601B	LYC 290-HP IO-540-S1A5	1800	$40,000	165	2025 LBS	233 KTS	±$110,000
1974-76 AEROSTAR 601P	LYC 290-HP IO-540-S1A5	1800	$40,000	165	2025 LBS	232 KTS	±$120,000
1979-81 AEROSTAR 602P	LYC 290-HP IO-540-S1A5	1800	$40,000	165	1900 LBS	232 KTS	±$168,000
1982-83 AEROSTAR 602P	LYC 290-HP IO-540-AA1A5	1800	$40,000	165	2025 LBS	229 KTS	±$185,000
1984 AEROSTAR 700P	LYC 350-HP TIO-540-UTA	1800	$73,000	165	2135 LBS	258 KTS	±$320,000

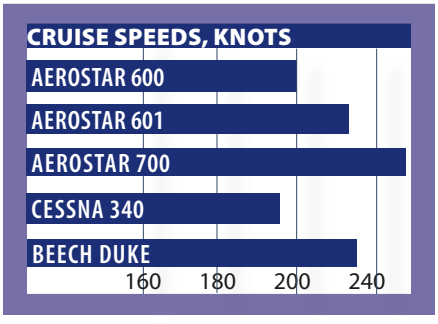
RESALE VALUES

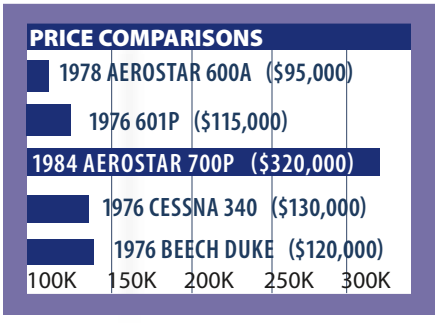


SELECT RECENT ADs

AD 03-22-01	AUX FUEL PUMP TRANSFER
AD 01-08-10	MAIN GEAR SIDE BRACE ASSEMBLIES
AD 98-24-29	UPPER SPAR CAP INSPECTION
AD 94-15-13	NOSEGEAR DRAG LINK CORROSION
AD 90-01-02	FIRE DETECTION KIT/RETROFIT







When searching the used Aerostar market, buyers will find a wide variety of avionics configurations. The panel in the top image has round-gauge flight instruments and the one at the bottom has Garmin glass.

Plans for nine-seat Aerostars with 450-HP piston engines and turbines died with him, unfortunately. Later that year, the company was acquired by Piper Aircraft, which moved it from Santa Maria to Vero Beach.

Piper kept at it, despite a soft market. It improved the wastegate system in the 601B and 601P, increasing critical altitude from 16,000 to 21,500 feet. A known-icing package—boots—was also added.

In 1981, the 602P was introduced, with engines and turbos certified and installed as a package by Lycoming. (Previously, turbos and wastegates were tacked on at the Ted Smith and Piper shops.) The last model, the 700P, was introduced by Piper in 1984 and had intercooled, 350-HP engines, cowl flaps and outward-rotating propellers. With only 25 built that year, the 700P is the rarest model. The most prolific model was the 601P, with 454 built by both Ted Smith and Piper.

The 600A remained in production the longest—10 years—but only 206 were built. Piper's figures show 59 600s, 68 601s, 48 601As, 41 601Bs and 110 602Ps built before the line closed for good. Although Piper exited the cabin twin market by the late 1980s, the Aerostar line endured.

In May 1991, Piper sold the type certificates and STCs to Aerostar Aircraft Corp., headed by Stephen Speer and James Christy, both of whom had been involved in the Ted Smith days. The new owners pledged to keep Aerostar parts and support flowing and they've done just that.

One upgrade they offered is called the Super 700 Aerostar, which takes 601P and 602P Aerostars and fits them with 350-HP Lycoming TIO-540-U2A engines turning three-blade Hartzell props.

The airplane gets a gross weight boost to 6356 pounds ramp weight. Claimed 75 percent cruise is 261 knots, and initial climb rate is 1875 FPM. At economy cruise (55 percent), the fuel burn is 32 GPH and claimed speed is 225 knots. Owners report that the mod is worthwhile and the speed claims realistic.

MID-WINGS

Ted Smith evidently liked mid-wing designs, as anyone who has seen a photo of an A-20 would surmise. The Aerostar's wings are mounted midway along the oval fuselage and are the same NACA-64 series used on the Learjet. External skins are butt-joined and flush-riveted. Primary flight controls are via push-pull tubes, torque tubes and bell cranks.

Like larger aircraft, the landing gear, main gear doors, flaps and the nosewheel steering system are electrohydraulic. The nosewheel has its own steering control and isn't connected to the rudders. Fuel-selector valves and elevator and rudder trim systems are also electric.

The engines are supposed to draw fuel from the two 62-gallon wing tanks and from the 41.5-gallon fuselage tank at the same time and at a rate that leaves 12 gallons in the fuselage tank when the wings have been emptied. But this only works in straight-and-level flight. The thin wing tanks easily become unbalanced—there are only two degrees of wing dihedral—and crossfeed must be used to bring them back in sync.

This shortcut led to trouble if the single fuel pick-ups in the wings became unported and electrical power was lost, leaving no way to reposition the valves. AD 79-1-5 sought to solve the problem by placarding crossfeed procedures and installing a

An engine swap for a first-gen Aerostar 600, top photo, could easily cost $60,000 per side. With counter-rotating 350-HP engines, a late-model 700-series Aerostar offers even better single-engine climb, bottom.

low-fuel warning light and individual tank quantity indicators.

The 601 models have relatively high-compression turbonormalized engines, producing 290 HP. The 601P is especially prone to detonation if leaned to peak EGT at altitude. The 602P's engines have a lower compression ratio, alleviating the detonation problem, and are ground-boosted to maintain 290 HP at 37 inches MP.

Alternators on most Aerostars are rated at 70 amps, but can actually put out only about 55 amps due to heat. Potential buyers should be wary of any airplane with an electric air-conditioning system. It's heavy, has four motors that draw a lot of juice and cannot be used at night or in IMC. A better bet is an engine-driven-compressor system.

PERFORMANCE

If you want speed, look no further than an Aerostar. The normally aspirated 600s will easily steam along at 210 knots on 34 GPH at 70 percent power. The 601 model can turn in an amazing 233 knots on 36 GPH at 70 percent power at 20,000 feet. The higher-powered 700P trues at a whopping 260 knots on an equally impressive 51 GPH at 81 percent power and 25,000 feet; throttled back to 65 percent power, a 700P can do 230 knots on 36 GPH.

As if the stock airplanes weren't fast enough, Machen conversions make them even faster. At 75 percent power and 25,000 feet, a Machen Superstar 650 cruises at 240 knots on 42 GPH; a Superstar 680—intercooled—does 250 knots on 40 GPH. Machen conversions also improve single-engine performance.

Maximum published single-engine rates of climb are 360 FPM for the 600, 240 FPM for the 601s and 602P, and 320 FPM for the 700P. Accelerate/stop distances—with 20 degrees of flaps for takeoff—are about 3100 feet for the 600 and unpressurized 601s, 3400 feet for the 601P and 602P and 4000 feet for the 700P.

Since it was intended to become a jet one day, Aerostar handling can be said to be jet-like. That means high flap speeds—174 knots indicated for most models—and fairly high gear speeds of 156 knots. The Aerostar's wing loading is an eye opener: 35.4 pounds/square foot.

High wing loading translates to high speed and a soft ride in turbulence, but also a brisk stall and a narrow slow-speed envelope. Crossing the fence at 100 knots, the Aerostar isn't a terrific short-field performer but owners say it's adequate.

Both Piper and the factory have modifications to improve the Aerostar's stall behavior at aft CG and alleviate the restrictions imposed by AD 83-14-7. Most owners prefer Machen's vortex generators to Piper's water rudder. Stall behavior has been the focus of attention, thanks to tendencies to stall sharply when held into the break. The AD was issued to improve stall controllability with flaps extended with aerodynamic kits like those mentioned above.

CABIN COMFORT, LOAD

Passengers are sometimes taken aback by having to enter the cabin by clambering over the pilot's seat; that's the only door in the airplane. Once inside, an Aerostar is reasonably comfortable, but no one would mistake it for a chapel; the noise level is quite high, especially in models without pressurization.

The cabin is more than 3 inches wider than a 55-series Beech Baron's, but 3 inches narrower than a Cessna 310's and has 2 inches less headroom.

AEROSTAR MISHAPS: NO SMOKING GUN

Our practice in analyzing the accident history of an aircraft model is to review the 100 most recent and break them down by cause. We're looking for indications of areas of concerns for prospective owners.

We looked back to 1985 in our search for 100 Aerostar series—every model—accidents. We found only 68 in the U.S. We also noticed that there has only been one reported Aerostar accident since 2012 and it was a maintenance-related main gear hangup. That's quite good for a fleet that originally numbered more than 1000 airplanes.

We liked that we saw only four runway loss of control (RLOC) accidents—an indication of good ground handling and ability to handle a crosswind. One of those four events happened on landing in a 40-degree crosswind, with a half-mile visibility in blowing snow, on a slick runway.

As with a number of other airplanes, an Aerostar has to be sitting level when being fueled to completely fill the tanks. Otherwise, our accident review revealed no issues with fuel system design. There were six fuel-related accidents. Four involved fuel exhaustion with one of those following fueling on a sloping ramp—the fuel totalizer showed 15 gallons remaining when things got quiet. The other two fuel-related prangs were a result of mispositioned fuel selectors. One fuel exhaustion crash involved a pilot who was unable to follow repeated attempts by ATC to give him vectors. He flew around randomly until running out of fuel. The autopsy found tranquilizers in his blood.

Our experience in flying Aerostars is that they are high-performance machines that are not tolerant of a pilot who hasn't had a thorough checkout and isn't on his game. The accident record, in our opinion, reflected that experience. In most cases, the pilot let the airplane down rather than the converse.

We found seven accidents that were initiated by mechanical issues with an engine and the pilot was unable to either keep the airplane under control or get it to a runway on the remaining engine.

We've always acknowledged that the Aerostar airframe is robust and had that opinion supported by an accident in which the crankshaft in the right engine sheared as the pilot was turning final. The prop could not be feathered, which, with the gear and flaps down, meant the airplane could not make the runway. The pilot put it onto a road where it hit various objects and vehicles on rollout. The three strapped-in occupants were uninjured.

Maintenance issues—and decisions related thereto—were factors in more than one accident. A pilot who experienced a problem with one engine surging in cruise flight at altitude descended, landed and called his mechanic to discuss the matter. He decided to fly the airplane, with three passengers, on to his destination. The affected engine quit shortly after takeoff and the pilot put the airplane into a field where it came to a quick stop against a ditch. No one suffered more than minor injuries.

The "you can't make this stuff up" accident we reviewed involved a pilot who, during preflight, discovered that the rudder trim tab couldn't be centered. His solution was to remove the bolt connecting the tab to the actuator, leaving the tab free. The trim tab has no mass balance—it is restrained from entering flutter by being connected to the actuating system.

After takeoff the pilot "experienced vibration." That was the trim tab in flutter, which potentially could have excited flutter of the rudder and loss of the rudder. Sensibly, he returned for landing. Unfortunately, he hit the airport fence on final, pulled up and then landed on the runway so hard he drove the main gear up into the wings.

Many owners have taken out one of the middle seats to make more space in the cabin. For a cabin-class airplane, it's on the tight side.

It's also not a great carrier. An Aerostar is hard-pressed to carry even five adults, their bags and a reasonable load of fuel. Real-world useful loads vary from a meager 1600 pounds for a lavishly equipped Aerostar to a marginal 1800 pounds with average equipment. Also, the airplane has a relatively narrow CG range and it's easy to bust the limits. Weight-and-balance calculations are a good idea for takeoff and landing profiles, because the CG moves forward as fuel is burned. And in a twin, CG is always a worry for engine-out operations.

MAINTENANCE

No surprises here. The Aerostar can be a hangar queen, but owners who say it's a wrench hog also say that this is to be expected in any aircraft of this class and age. Even so, the Aerostar has a couple of marks against it. For one, it's a compactly built airplane, so its systems are tightly packed and difficult to get to. Second, the systems themselves are complex. One owner reported dozens of individual failures in his first 18 months of ownership and another said elevating the airplane to squawk-free status is hopeless.

Since the type certificate is owned by a solvent business, owners do have a place to go for support. Aerostar Aircraft Corp. is holding up its end of the bargain, picking up on the task of issuing service bulletins. Some 18 have been published since the company bought the TC. All are conveniently listed on the Aerostar website. A critical one—SB600-136—describes visual inspection of the wing attach fittings. Contact the factory at 800-442-4242 or www.aerostaraircraft.com.

MODS, OWNER GROUPS

Interestingly, the factory offers the most mods for the Aerostar. These range from service bulletin kits to factory options available at the time the airplane was built, but not installed. The Machen Superstar upgrades are still available—the Aerostar factory website has a complete list—and given the low purchase price of the airplanes, many

Pilot and passengers ingress and egress the cabin of an Aerostar via a clamshell door on the left side of the fuselage.

owners may find the prices attractive. Machen, by the way, still exists as a manufacturing company, but all of its mods are provided only through the Aerostar factory.

The Aerostar Owners Association publishes a magazine and holds regional meetings that focus on safety and maintenance. Contact the Aerostar group at 918-258-2346 and www.aerostar-owners.com.

OWNER FEEDBACK

I have been flying since 1969 and I'm getting to be an old guy. I'm a single- and multi-engine, instrument, and commercial-rated pilot with over 6500 hours of flight experience. I was trained by Emory Wheat in 1969 through 1970 at Aldino Airport (0W3) in Churchville, Maryland, and he was my aviation mentor my whole life until his death last year. At the time, he was a charter and demo pilot, flying the Aerostar 600 for Henry Weber Aircraft—an East Coast sales center in Pennsylvania.

While moving up through the ranks as a single-engine pilot, I was able to fly right seat with Emory in the Aerostar and accumulated over 100 hours. I cut my teeth as a new single-engine pilot in a Mooney Super and then in a Mooney Executive. Next came a Piper Cherokee Six and then a Piper Saratoga, which allowed me to fly an air hearse service for my funeral business.

In 1992 I moved up to N444HM, a Smith Aerostar 600A. It was a fix-up project, but a good, solid airplane. I had the engines overhauled by Columbia Aircraft in Bloomsburg, Pennsylvania, in 1993 and had it painted by Cimarron Aircraft Painting in Oklahoma City, Oklahoma, in 1994. The paint job was excellent, but I had questions about the engine overhaul after experiencing a deer strike while landing in Ocean City, Maryland, in 1997. While having both engines torn down, we found problems with the camshafts in both engines after only 300 hours on the overhaul. Needless to say, I would not return to Columbia, if they are still in business, for my next overhaul.

The Aerostar 600 has served me well as I basically fly around the eastern half of the United States. Henry Weber Aircraft in Lancaster, Pennsylvania, still performs my annual inspections and maintenance. I would recommend them to any Aerostar and Mooney owner. Steve, Doran and Larry at Weber's have many years of experience with both aircraft and know them inside and out.

The Aerostar is definitely a pilot's airplane and anyone transitioning up to it should seriously consider initial training by an experienced Aerostar instructor. Even after the initial training, I recommend annual refresher training as the Aerostar is

AEROSTAR TRANSITIONS: MORE LIKE A JET

I specialize in Aerostar flight instruction and learned a long time ago that doing initial training in an Aerostar isn't like multi-engine training in slower and less complex twins. Training in an Aerostar with its myriad of special systems to include the hydraulic, fuel and nosewheel steering, combined with its unique flight characteristics, is more like training in a jet then training in a Piper Seneca or Cessna 310. Part of that is because of the heavy wing loading and high horsepower. Moreover, the Aerostar is capable of operating as high as FL 250, which adds potential hypoxic and weather-related issues. This hardly makes the Aerostar (in any of its different models) the ideal transition airframe for a low-time multi-engine pilot.

There are also mechanical issues to consider since the newest Aerostars are over 40 years old. In most cases each airframe has been through multiple owners, and my experience is that some previous owners were less than fastidious in their level of maintenance during many hours of hard operation. Also, a dwindling number of maintenance shops have experienced mechanics on staff who can adequately service these aircraft, in my view.

Still, when pilots begin their Aerostar transition training they are impressed with the aircraft's speed and its trip endurance. After all, it is the fastest production multi-engine aircraft produced. The relative cheap purchase price of the aircraft makes it attractive to pilots stepping out of Cirrus, Cessna TTx and other high-performance singles. But the addition of the extra engine adds a level of ground and flight handling that didn't exist in their previous ride. There have been runway excursion incidents and accidents from both new pilots and instructors who are unaware that the alignment on the runway and non-counter-rotation of the props require a high level of vigilance when bringing up the power for the first time on the runway. The edges of the concrete can quickly shoot by when the pilot or unaware low-time flight instructor spools those high-horsepower engines for takeoff and the aircraft darts immediately for the brush on either side of the runway. Few instructors warn the transitioning pilot of the nosewheel alignment problem when taxing into position or leading with the left throttle because of the conventional turning of the props.

The insurance companies generally require between 10 and 15 hours of flight time in the aircraft for transitioning experienced multi-engine pilots or instructors and 20 to 30 hours for low-time (15 hours or less) multi-engine pilots or instructors. Additionally, since there are few if any flight training devices (FTDs) or pure simulators that emulate the many Aerostar models, most insurance companies require in-aircraft training. The number of insurance company-approved instructors can be counted on two hands. The reason is that the majority of flight instructors simply have no experience in Aerostar airframes and that likely won't get better. After all, there is little incentive for specialized instruction for forty-year-old-plus aircraft when there are only 700 or so still flying fleet-wide.

Having said all of these negative things about transitioning to the Aerostar, nothing is more beautiful then to look out the side window of the aircraft and see the silhouette of the impressive Aerostar moving rapidly across the ground. My advice to those considering a transition is to enjoy the Aerostar, but use prudence and caution when considering such a flight-capable aircraft.

—Ron Cox

a high-performance, semi-complex aircraft. I use Lester Kyle in Vero Beach, Florida, for annual training. Even after 25 years and some 2000 hours in the Aerostar, I always learn something new during each session.

Thank you for allowing me to ramble about the Aerostar. I hope something I have said will help other *Aviation Consumer* readers that are considering an Aerostar.

You do a good job with the publication and I look forward to receiving it every month.

Howard McComass III
Abington, Maryland

I have owned a 1978 Ted Smith Aerostar 601P/700 since 2002. At the time I bought it, I'd been looking for a pressurized piston twin that could easily haul my family of four with a 1000-mile max range. I needed one with a single-engine service ceiling high enough to clear the mountainous terrain where we live. I'd settled on a Cessna 340 and I was down in Las Vegas looking at one. Parked right next to it was an Aerostar. The owner was there, told me it was for sale and asked if I wanted a ride. During the taxi, I began to like it.

The electric nosewheel steering and cockpit design makes you feel a bit like you're in a jet. With brakes

released at full power, the acceleration really presses you into your seat. At rotation, where many other piston aircraft anemically rise off the runway, the Aerostar leaps into the air like it's just aching to be up there.

With gear up and flaps up it easily climbs at 2000 FPM. Maneuvering the Aerostar is pure joy. Roll and pitch response is snappy and the plane goes where you point it. The high wing loading makes the Aerostar cut through turbulence like a knife through butter. Landing the plane is also impressive. It's so close to the ground that sometimes I only know I've touched down because I hear the tires screech.

I was so impressed at how this Las Vegas plane felt to fly, I agreed to buy it right then and there. It was love at first flight. Now I don't haul my family anywhere; I fly them.

The numbers: I flight plan for 220 knots true and typically fly in the low flight levels. I burn an average 41 GPH. Total wet cost per hour for me has been $460 at 100 hours per year. That would drop to $360 if I flew 200 hours per year. This includes my insurance cost, which dropped to $2800 per year to cover both hull and liability. At over 1000 hours in type, my insurance company no longer requires annual recurrency training.

I've had four "opportunities" to fly and land this plane on one engine and its behavior on one engine is also impressive. Directional control is downright docile compared to the Seneca and Beach Travel Air I've had similar experiences with. I assume this is because of the long-lever arm from center of lift to the rudder, and the short-lever arm from the operating engine (they are mounted quite close to the fuselage).

The key to avoiding disaster here is not to get too slow. The long rudder lever arm also makes this aircraft a breeze to land in strong crosswinds, which is something else we have a lot of where I live.

In 2008 I had the failing -S1A5 engines replaced with factory-rebuilt -U2As. With the old engines, 90 percent of my unscheduled maintenance had been under the engine cowls. Thirty percent of my flying time was to and from a maintenance facility because there's no mechanic on my home field.

Now with the new engines, it seems I only have to fly to The Flight Shop in Brigham City, Utah, for scheduled oil changes and annuals.

The Aerostar is a wonderful pilot's aircraft that's a pure joy to fly. For the cost, speed and endurance, there is no pressurized piston twin that compares.

Peter Jensen
Rock Springs, Wyoming

I have flown my 1977 Ted Smith Aerostar 601P for more than 3200 hours since 1990. I will leave the financial point of view to others. I feel if you have to ask how much it costs to own and operate a pressurized Aerostar then you can't afford it.

Aerostar owners/pilots are a cult just like Harley Davidson Motorcycle owners. We like the handling, the power and the ramp appeal. Many of us have owned or flown turboprop and jet aircraft, which we enjoyed as well, but when we get to the end of our flying, the Aerostar is still in our hangar and the others have been sold. That might explain why many of the nicest Aerostars are not for sale.

The Aerostar Owners Association has been around since 1970 with some 350 members worldwide. Through our organization we have seen great achievements in maintenance and safety for our beloved Aerostar and pilots.

In 2002 we suffered the loss of 10 Aerostars and pilots due to accidents. After 2002 we started an all-out effort to eliminate Aerostar accidents, both fatal and nonfatal. We made progress. Flash forward to 2013 where we had only had three accidents and none of them were fatal. The reason for our success is better initial and recurrent pilot training with emphasis on understanding of the Aerostar systems.

Aerostar owners are blessed to have all of the parts they need and a manufacturer who continues to provide us with new options for our Aerostars. In the downturn of general aviation it is great to have Aerostar Aircraft Corporation to provide us with unlimited support.

To quote one of our new AOA members, "The Aerostar is a Baby Airliner." He is right. These airplanes have hydraulic-operated flaps, land-

The Aviation Consumer

DYNON INSTALLS

(continued from page 2)

Dynon expects that many of these installers will have previous avionics installation experience, perhaps on their own aircraft or on other experimental aircraft. That's an obvious question for you to ask when nominating an installer for your own Dynon project. If the A&P hasn't installed anything more modern than a Narco Superhomer, you might want to find one who has because there will be a steep learning curve, in my estimation.

Moreover, an IA who keeps the certificate current, but isn't actively doing airframe work or doesn't understand EFIS technology, might not be the best candidate. There will be wiring that's interfaced with third-party equipment, including IFR navigators, audio systems and antennas. There's also software configuration, including setting the autopilot gains and other post-install tweaks. Plus, the interface includes mandate-compliant ADS-B Out.

Dynon is launching its Certified HDX system into a competitive EFIS retrofit display market—which will become even more competitive overnight if Garmin certifies its G3X Touch. It's no secret that Garmin is dominant on the shop level, but a good shop is one that presents a buyer with options, including other brands with comparable capabilities. If your shop doesn't, I would consider going elsewhere. Still, I suspect Dynon is at least somewhat concerned that some shops will push Garmin retrofits over the Certified HDX. While Dynon made it clear that it eventually plans to build Certified HDX dealerships at larger avionics shops (in addition to supporting A&P/IAs to do the work), I predict we'll see more Dynon dealerships at smaller shops than at larger ones, especially those that don't sell Garmin or may not even hold a repair station certificate. There are plenty of them.

"From our perspective, we'll be looking for capability and quality more than the very particular FAA credential," Schofield said. Until Dynon builds its network of installers that fit that criteria, it's up to the aircraft owner to find one they trust. Like it or not, it's a departure from the old-school regulatory mentality the industry has been determined to fix. And it uniquely gives customers more choice and influence in the way avionics are installed. That's a big step forward.

—Larry Anglisano

AEROSTARS

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ing gear and electric nosewheel steering similar to some airliners. There's cabin pressurization, pneumatic door seals and a temperature-controlled cabin using bleed air for cabin heat at altitude.

A few years ago I wrote an article for the Aerostar Log titled "What's Your Mission?" The article talks about the majority of Aerostar models (except the 702P and the Aerostar Jet), which were not available at that time. I highly recommend this article to anyone thinking about an Aerostar; it will help you understand the value of Ted Smith's vision.

As you can tell I'm very happy with my Aerostar decision of 24 years ago and will continue maintaining and training in my Aerostar until they no longer let me fly. Every time I take off and climb to the flight levels in my Aerostar I'm always amazed with her performance. The only thing better than my Aerostar would be an Aerostar Jet, which I have had the pleasure to fly as well. Ted Smith would be so proud of the longevity of his design.

Ken Bacon
AOA Executive Director

FEEDBACK WANTED

CESSNA SKYMASTER

We're preparing a report on the Cessna Skymaster twin market in an upcoming Used Aircraft Guide in *Aviation Consumer*. We want to know what it's like to own these airplanes, how much they cost to operate, maintain and insure and what they're like to fly. If you'd like your airplane to appear in the magazine, send us any photographs (**full-size, high-resolution please**) you'd like to share to the email below. We welcome information on mods, operating expenses or any other comments that can be helpful for buyers considering one. Send correspondence by November 20, 2018, to:

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