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The Aviation Consumer®

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The Aviation Consumer

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E-PLANES: TOYS OR TRAINERS?

As a motorcyclist, I've been watching with interest new electric motorcycle technology. With e-bikes, it's easy to hit high points in styling, handling and even speed, but endurance is another matter. Most models don't appeal to road trippers and performance riders, but there is some interest for short urban commuting. Pondering Harley-Davidson's LiveWire electric model, it has plenty of cool-factor to consider adding it to a collection, but as a primary rider, I think it's going to be a tough sell. If that's the case, it might appear the Motor Company has a marketing challenge on its hands. Heck, the old-school Harley demographic still resists liquid-cooled engines.

As electric aircraft emerge, a similar identity crisis looms. With an approximately three hours of endurance between charges, and Piper Cub-like cruise speeds, will an e-plane be a hangar toy or a workhorse?

That's what I asked George Bye, the CEO of Aero Electric Aircraft Corporation (AEAC), the company working with engineering partner PC Aero, GmbH on the Sun Flyer solar-electric aircraft. While he's numb to the chiding about airborne extension cords, Bye believes the progression of electric motor, battery, solar and composite construction technology has finally reached a level where an e-plane can be the game-changing next generation trainer.

When asked what kind of sales volume he expects from the plane that might end up in the $190,000 price point, Bye noted that more expensive factory-new Cirrus, Diamond and Cessna trainers sell in low quantities and thinks the Sun Flyer can do better. After testing new and cheaper 250-Wh/kg battery packs, Bye said the Sun Flyer's endurance is well-suited for training flights.

AEAC estimates direct operating costs at $4.65 an hour compared to $74 per hour for a Cessna 172, accounting for maintenance and fuel, although you certainly won't see the e-plane advertised at five bucks an hour on the school rental board. While not pitched as an LSA, the targeted weight is at the 1320-pound LSA limit. LSAs haven't fared well in the hands of ham-fisted students and I'm not sure the landing gear on the Sun Flyer will be more forgiving.

In its well-received initial pitch to the FAA, AEAC has already defined the airplane as a two-seat, parachute-equipped primary trainer, worthy of a standard airworthiness certificate for day and night VFR, and one that's an economic imperative for a new breed of students. Bye defined them as career-focused student pilots aiming for jobs flying turbine equipment, although he's not dismissing the appeal to flying clubs and owners looking for a weekend toy. Spartan College of Aeronautics and Technology signed on to reserve a set of Sun Flyers to offer primary flight training to students. The college was founded in 1928 and is a respected trade school for aircraft maintenance, avionics and flight training—seemingly a good launch customer, in my view.

At first look, the Sun Flyer has no shortage of gee-whiz appeal for the targeted younger generation. AEAC displayed the single-seat prototype at AirVenture last summer and its sleek composite airframe glossed with bright yellow paint attracted sizable attention from kids and adults alike. Ashley, my teenage daughter and student pilot, gave it the nod for styling and said she would fly it. And while her head is spinning learning to hot-start a fuel-injected Continental, operating an electric motor could be less stressful. But is an electric trainer a logical stepping stone to operating a turbine? Bye thinks it is, comparing engine ops to that of single-lever-control Jet-A-burning diesel engines.

AEAC plans to have the two-seat version of the Sun Flyer at AirVenture 2015 and continues to flight test the single-seat version from its home base at Centennial Airport in Colorado. It's too early to know if electric planes will have enough market appeal, but like Harley's LiveWire e-bike, the Sun Flyer e-plane project has enough cool toy factor to pique my interest. —Larry Anglisano

DODGING ADS-B

I am disappointed that so few people (and aviation magazines) are making a stink about the lack of anonymity and privacy associated with most ADS-B solutions. If there is anyone that believes that the FAA, Customs, Homeland Security and the media won't eventually be using that ADS-B Out data for fees, monitoring, enforcement and speculative reporting, then I have a bridge to sell you in New York City.

There are ADS-B solutions that have an anonymous mode for VFR. A mode-C transponder married to the Garmin GDL88 UAT is one of them. The new Mode S ADS-B transponder solutions are not. I will not buy one of these 1090ES solutions for that reason.

On the adoption front, if the FAA really wanted pilots to embrace ADS-B Out, the mandate would accommodate portable ADS-B Out devices, at least for VFR. Pilots love portables. We gobble up headsets, portable GPS, weather receivers, transceivers, traffic detectors, iPads and of course ADS-B In devices. Portable ADS-B Out with anonymous mode would keep the cost down and utilization up not just for basic airplanes, but for all types of aircraft, including gliders, antiques, lighter-than-air, ultralights and even drones.

Rob Dant
via email

I think putting a 2500-foot AGL floor under 30-mile Class B veils would eliminate the real need for ADS-B equipage for 85 percent of small aircraft. This would gain them access to many small general aviation airports that are close to Class B airports, without any increase in danger for the Class B airspace users. Many of us can live with the 10,000-foot MSL altitude limit—which can go to 17,000 feet over the highest mountains.

This will give many of us plenty of time to install ADS-B gear if we later desire it. I have essentially stopped using Class B airports already due to the outrageous ramp fees ($40 to drop off a passenger?) at many FBOs that really only cater to the rich in their bizjets.

Arthur Thompson
Hereford, Arizona

TWIN CESSNA GROUPS

I just wanted to congratulate you on your review of the Cessna 310 in the December 2014 issue. It was an informative and entertaining read. However, I must take issue with your statement that the Cessna Pilots Association is the go-to place for twin Cessna owners.

I am currently a member of both the Cessna Pilots Association and The Twin Cessna Flyer organization (TTCF), and I read both forums from time to time. The CPA only has one forum dedicated to twin Cessnas, and that is not at all active. In comparison, the many TTCF Forums are alive and well. There is a wealth of information in both, but as a T303 owner, I have to say the TTCF is more relevant to me.

Adam Crowther
via email

CHOOSING A FLOATPLANE

I was recently in the market for an amphib, and as your floatplane article in the December 2014 issue noted, each plane has its tradeoffs.

I was looking for a plane that had decent load capability (four people) and decent speed. While a Cessna 206, 185 or a Lake Renegade can carry four people and some luggage, cruise speed is somewhere in the neighborhood of 110 knots. That's nothing to write home about. Plus the purchase price and fuel burn would be way over my budget. Moreover, I plan on operating in salt water and an aluminum plane, no matter how well cared for, will have constant corrosion problems.

While doing my research, I stumbled across and bought the Seawind 3000. Not only does it really cruise at 150 knots and burns 12 GPH, it has a useful load of just under 1000 pounds. Behind the rear seats is a long cargo hold that's great for carrying skis, fishing poles or golf clubs.

Some Seawind owners even fold the rear seats forward and camp in the plane, using the cargo hold to extend the legs while sleeping.

I can carry four adults and four hours of fuel. Filling the 110-gallon tanks would only work if there are two people onboard. I normally carry about 60 gallons—plenty for four hours of flight—including reserves. The plane is made of composite, so salt water will be much less of a concern.

There are about 80 of them flying in the U.S. and street prices for a good condition model are between $150,000-$180,000. The majority of those for sale seem to have less than 500 hours on them and are powered by a 300-HP Lycoming IO-540.

The Seawind company has been taken over and is attempting to sell a certified version, called the Seawind 300. It claims to be near the end of the testing phase. The Seawind 3000 is a kit that's no longer in production, but if you get serious about a Seawind, contact Planemakers in Florida (www.planemakers.com). It built 20 of them and does prepurchase inspections.

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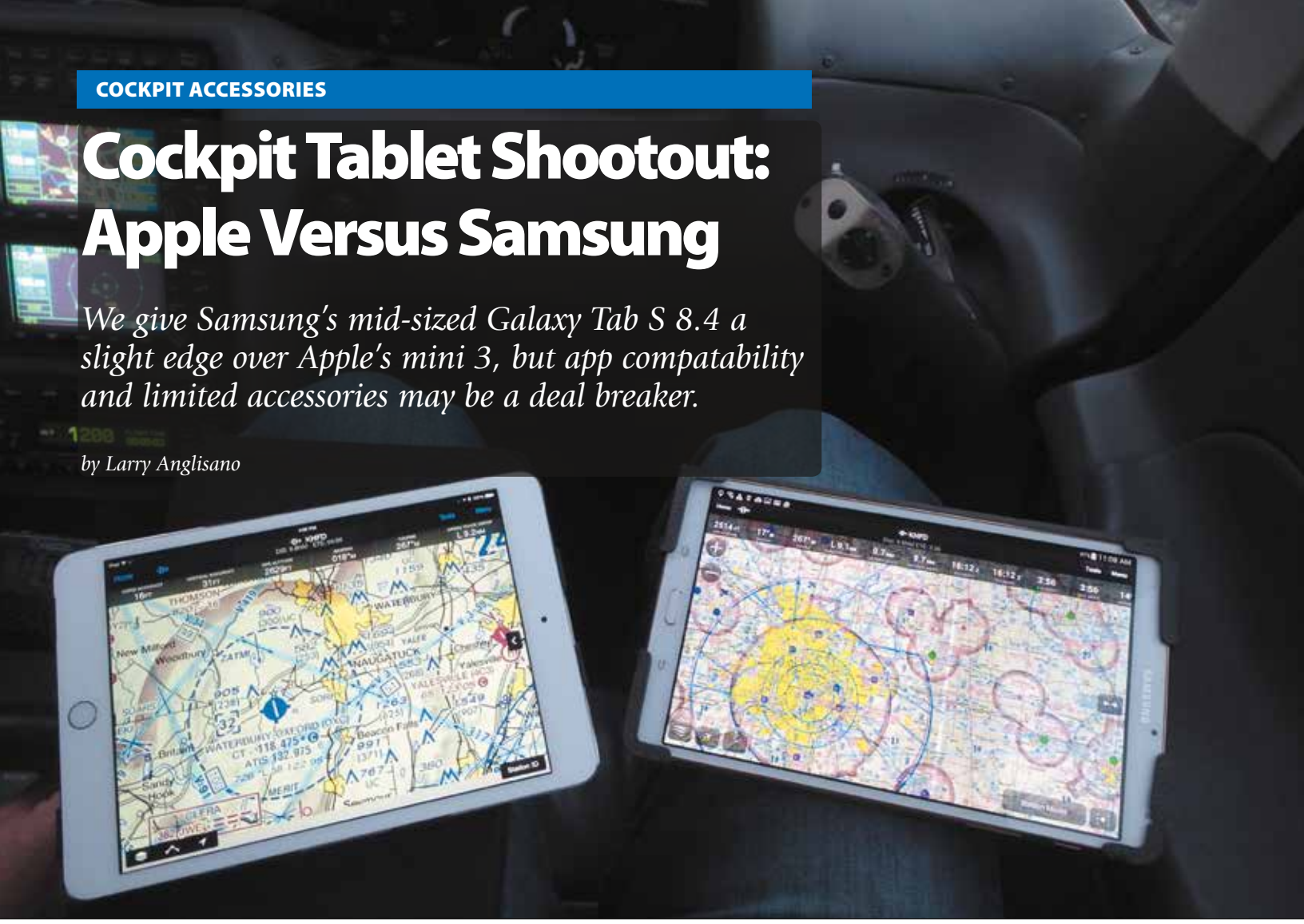
Cockpit Tablet Shootout: Apple Versus Samsung

We give Samsung's mid-sized Galaxy Tab S 8.4 a slight edge over Apple's mini 3, but app compatability and limited accessories may be a deal breaker.

by Larry Anglisano



With increasing disenchantment with Apple's market dominance and high-cost accessories, some pilots have been asking the $500 question: Is Samsung's mid-sized Galaxy Tab S 8.4 good enough to ditch the iPad once and for all?

In evaluating new navigation apps for Android we were impressed with the Galaxy tablet, and the more we used it in a variety of cockpits, the more we preferred it over the original iPad mini.

The smaller Galaxy tablet (a step down from the 10-inch model) stands out for its impressive screen quality, decent battery life and convenient size for tossing around the cockpit. There is also the Google Nexus 7. We evaluated it in the June 2014 issue of *Aviation Consumer* for its utility as a second display when slaved to the iPad.

To find out, we put Apple's newest mid-sized table, the mini 3, head-to-head with Samsung's Tab S 8.4. For a fair comparison, we evaluated both devices running Garmin's Pilot navigation app, one of the few programs compatible with both operating systems. Plus, a single subscription can be shared among them. Both devices were evaluated in the cockpit of a Cirrus and a Piper Cherokee during the day and at night. To get a true read on display quality, we used the tablets with and without antiglare screen covers and tried them with mounting hardware.

FORM, DISPLAY FACTOR

We'll talk first about the dominant iPad. Despite the larger screen, we gave up on the full-size iPad and other 10-inch tablets for cockpit duty years ago because managing them proved awkward. Moreover, the larger iPad doesn't work well for yoke mounting and can be bulky even when knee mounting. If you mount it to a window with a suction mount or to the glareshield (a practice we discourage due to flail safety issues), it could obstruct the view outside. If you have to mount it, we think it's a better alternative to the larger iPad. It measures 5.3 inches wide, 7.87 inches high and is 0.29 inches thick, weighing 11.68 ounces.

Of course, the smaller form factor means you'll sacrifice screen area, which is 6.4 by 4.74 inches. That can be problematic for aging eyes, especially when viewing approach plates and deciphering textual weather and other fine-print symbology. On a side note, some app makers, including Seattle Avionics with its FlyQ EFB, are adding welcomed function-

The iPad mini 3 (left in the main photo) and Galaxy Tab S 8.4 are the right size to rest in the lap. Most pilots in our evaluation group preferred the iPad for approach plates and the Galaxy for VFR sectionals.

The Garmin Pilot app's main menu and navigation bar looks much the same on both tablets, but the Android version lacks sizable functionality, including terrain and obstacle alerts, traffic alerts, active flight plan data and synthetic vision. Both tablets have power receptacles at the bottom, lower right photos.

ality that enables users to configure the size and color of onscreen text. Other than new bezel colors, park the new mini 3 side-by-side with the first-gen mini and you won't tell the difference—until the screen comes alive.

The new mini 3 uses Apple's Retina display, a 7.9-inch LED-backlit touch LCD display with IPS, which stands for in-plane switching. IPS is far from new technology, although Apple marketing may lead you to believe it is. It was actually developed by Hitachi in the mid-1990s, but has become the gold standard for tablets and smartphones because it helps eliminate image distortion when you apply pressure to the touch display. Additionally, screen image coloring remains true at wide viewing angles, while built-in screen temperature control tweaks the display to compensate for lighting conditions, yielding a more uniform image. Screen resolution is 2048x1536 pixels. It's brilliant, in our view, in low lighting conditions.

But the ugly side of the iPad is screen glare—a real nag in sun-splashed cockpits. We admit to capitalizing and using it as a vanity mirror.

For our evaluation in a Cirrus, we tried the mini 3 both naked and with the MyGoFlight Armorglas antiglare screen protector. This is a $50 product that's made of actual tempered glass. We're impressed with its anti-scratch, anti-smudge and the dexterity it retains on the touchscreen. Based on our use, we recommend an anti-glare screen cover for most cockpits and to protect the display from getting scratched. If you decide to go without one, the Retina display has a fingerprint-resistant olephobic coating.

The basic operating logic is mostly unchanged from previous models, with the exception of the Touch ID fingerprint sensor for unlocking the tablet (if you passcode protect it). We initially dismissed the feature as gimmicky, but learned to appreciate its utility (a shortcut, really) in the cockpit, except when wearing gloves, of course.

Like the mini 2, the mini 3 uses Apple's A7 processor with 64-bit architecture—notably quicker than the A6 processor used on the original mini. Apple offers the device in either 16GB, 64GB or 128GB storage options, with WiFi-only or WiFi and cellular connectivity with GPS assist. The entry-level 16GB model is $399, while the 128GB model with WiFi and cellular is a whopping $729. Add a mount, protective case and screen protector, and you're into the thing for close to $1000.

SAMSUNG GALAXY

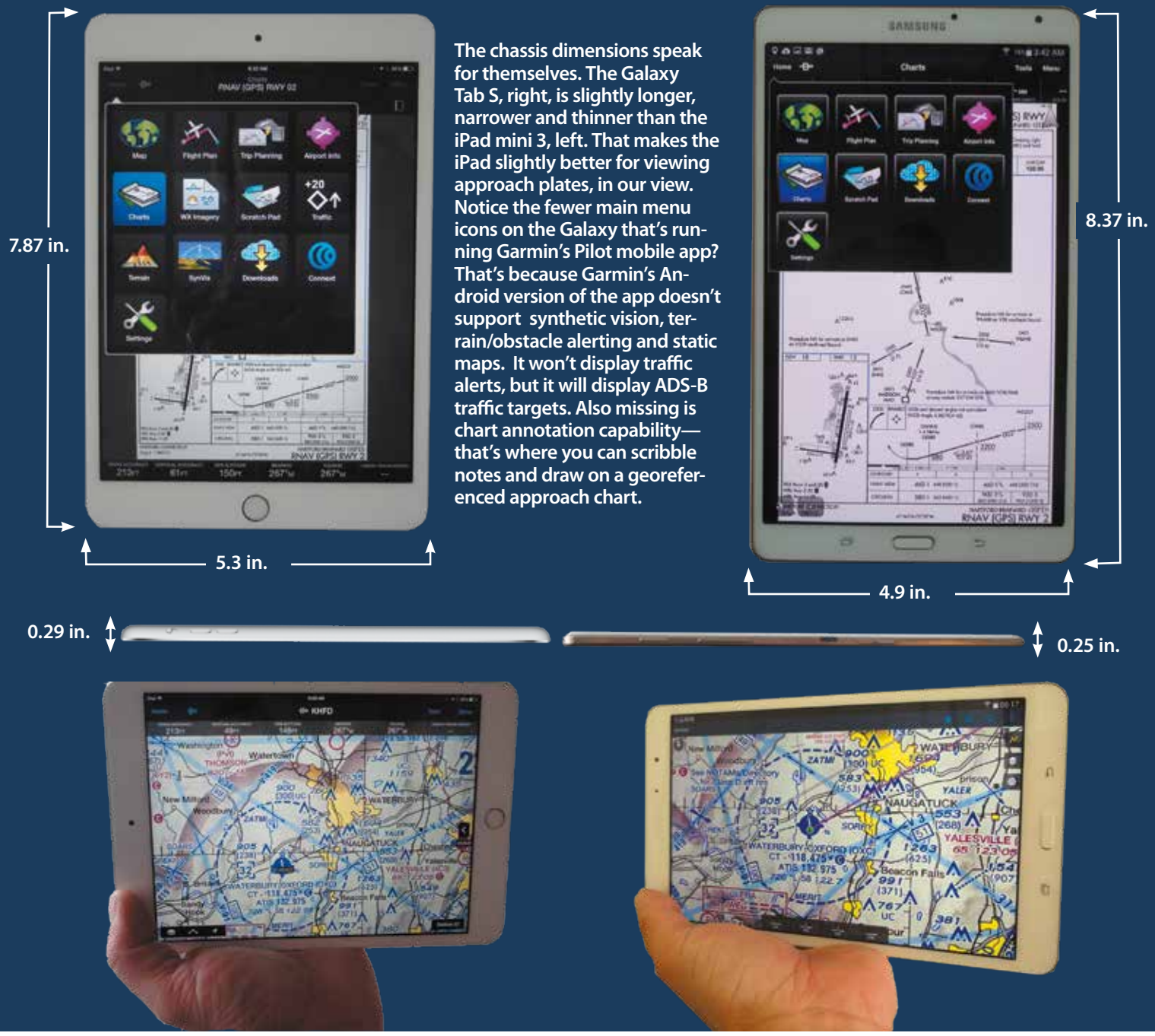
The $399 Galaxy Tab S 8.4 is Samsung's mid-priced tablet and preferred by at least two major Android aviation app makers we talked with for its processing power, size and screen resolution. Its chassis size is close to the iPad mini's, at 4.94 inches wide, 8.37 inches high and 0.26 inches thick. It weighs 10.37 ounces.

Two touch softkeys are on the bottom of the bezel. The "back" key steps you back in menus, and the "recent" key allows you to quickly change between the applications you used most recently. There is also a hardkey between the two softkeys for waking the tablet up. A volume

CHECKLIST

- ✚ Galaxy Tab S 8.4 handles cockpit sunglare better than the iPad.
- ⛔ Favored iOS nav apps either won't work on Android or are defeatured.
- ⛔ Cockpit accessories for the Galaxy, including mounting options, lag behind the iPad.

MINI 3 VS GALAXY TAB S 8.4



The chassis dimensions speak for themselves. The Galaxy Tab S, right, is slightly longer, narrower and thinner than the iPad mini 3, left. That makes the iPad slightly better for viewing approach plates, in our view. Notice the fewer main menu icons on the Galaxy that's running Garmin's Pilot mobile app? That's because Garmin's Android version of the app doesn't support synthetic vision, terrain/obstacle alerting and static maps. It won't display traffic alerts, but it will display ADS-B traffic targets. Also missing is chart annotation capability—that's where you can scribble notes and draw on a georeferenced approach chart.

key and main power button is on the upper right side of the case. Like the iPad, the power receptacle is on the lower edge of the case. This isn't a great location if you rest the tablet in your lap during flight. Chances are good that you have a drawer full of the familiar power cables left over from other devices that will fit the power jack.

The Tab S 8.4 has the same 2560 x 1600 WQVGA screen resolution and 16:10 aspect ratio as the 10-inch Galaxy. Next to the mini 3, Samsung's AMOLED screen technology might seem more vibrant in certain lighting conditions, and we think its punchy vibrance pays off when the screen is splashed with bright sun. The default screen setting is "adaptive," which automatically tweaks sharpness, gamma and color saturation, but you can also select AMOLED cinema, photo and basic modes. We mostly kept it in adaptive mode and adjusted the brightness as needed.

The Galaxy uses Samsung's Exynos 5 Octa-core processor, which is four 1.9 GHz cores and four 1.3 GHz cores. That geek-speak translates to lightning fast map redraws and quick app bootup, although we didn't find it to be noticeably quicker than the iPad when running Garmin Pilot.

As for internal storage capacity, the model with 16 GB is standard, but there is a version with 32 GB, priced at $579. A MicroSD expansion slot is on the right side of the case. That extra storage could come in handy for storing large chart libraries, for example. With the 16 GB iPad, you might have to delete stuff to gain storage space.

Standard on the Galaxy is an 8.0 megapixel rear-facing, plus 2.1 megapixel front-facing camera. The device has a fingerprint scanner for logging in as one of seven available users, with customizable profiles. This could be useful in club or partnered

aircraft where the tablet remains in the cockpit for all to use.

The operating system on our evaluator is Android 4.4.2 KitKat kernel with Samsung's TouchWiz interface. TouchWiz lets you run two apps side by side (accessed in multi-window mode) by swiping the screen.

Based on our trials, we give the Galaxy 8.4 a slight edge over the iPad mini 3 for battery life, but not by much. Both tablets should run for 10 to 12 hours, but the Galaxy's 3.8-volt lithium ion battery had slightly longer legs while running Garmin Pilot, occasionally browsing the web and with Bluetooth connections. On a side note, MyGoFlight sent us a sample of its Dualmicro rapid USB charger for plugging into a DC power receptacle. It's compatible with Apple and Android, can charge two devices at once, accepts input voltages from 12 to 30 volts, outputs 5 volts at 4.8 amps and has been tested for noninterference.

The Galaxy's GPS performance in the cockpit was flawless and we never found the need to connect with an external GPS. The non-cellular mini will require an external GPS. A GPS-equipped ADS-B receiver will work, too.

APPS, ACCESSORIES

This is where the iPad wins by a large margin. First, the market is flooded with cockpit accessories that cater to any iPad model. Browse the Sporty's catalog and you'll be overwhelmed with iPad gadgets, but not so much for Android tablets.

For instance, we attach the iPad to an articulating folio mount that has a leg strap, using it in the cockpit as a kneeboard. We couldn't find such a mount for the Galaxy, although MyGoFlight said it's working on one for release later this year. The company just introduced its Aviator Sportcradle, a universal mounting cradle that can accommodate most Android tablets when the device is naked or in a protective case. The $99 cradle with adjustable arms is compatible with MyGoFlight Sport-series yoke, suction and glareshield mounts, which are priced from $168 and up. There's also the Slipgrip holder and a RAM cradle.

The Sportcradle holds the Galaxy securely and allows for 360-degree rotation, but one of the attachment arms gets in the way of the tablet's bezel-mounted "back" softkey. It's workable, but not ideal. We attached both tablets to the control yoke of a Piper Cherokee and neither was too intrusive in either portrait or landscape configuration.

As for compatible navigation apps, Apple iOS has Android beat. The most popular apps include ForeFlight Mobile, WingX Pro 7, Seattle Avionics FlyQ EFB, Jeppesen Mobile Flite Deck and Garmin Pilot, to name a few. Of those, only Garmin Pilot and Wing X will work with Android, with limitations. For instance, Wing X for Android doesn't support synthetic vision, moving map, fuel prices or SmartTaxi charting. It also has limited flight plan filing functions.

To name a few popular apps for Android—with no compatibility for iOS—there is FlightPro (we covered it in the July 2014 issue of *Aviation Consumer*), AvNav EFB (we reviewed it in the October 2014 issue) and Naviator from 123west Software.

There is good Android compatibility with popular ADS-B receivers, including the iLevil devices made by Levil Technology, Garmin's GDL39, the Dual Electronics XGPS170 and the SkyRadar products.

CONCLUSION

As impressed as we remain with the mid-sized Galaxy tablet, we think navigation app compatibility could deter some users from switching from the iPad, particularly when accustomed to one of the top iOS apps. On the other hand, full-featured apps including FlightPro and AVnav EFB are certainly worthy, based on our trials. As for accessories, universal mounting options from RAM, Slipgrip and MyGoFlight are available, but the market simply has more choices for the iPad.

With an onboard GPS, additional storage capability and a display that slightly edges the iPad mini 3, we prefer the Galaxy Tab S 8.4 hardware. But until the navigation app and hardware market catches up—and there are signs that could be happening—we still favor the iPad mini 3 as the better overall choice for a mid-sized cockpit tablet.

That's the MyGoFlight universal Aviator Sportcradle connected with the FlexYoke swivel mount, left. It fits the Galaxy even when using the Belkin protective case. Like the iPad mini 3, the Galaxy Tab S 8.4 is conveniently sized for mounting on a typical control yoke, top.

Searey Elite: Upscale Amphib LSA

With a Rotax 914, the Elite has improved performance punch over the Sport model, plus an upgraded panel.

AIRCRAFT FLIGHT TRIAL

CHECKLIST

- For sheer balls-to-the-wall fun flying, the Searey is hard to beat.
- Design and construction makes for an easy-to-operate, durable amphib.
- More speed would be nice, but amphib and fast don't belong in the same sentence.

BY PAUL BERTORELLI

It's probably a journalistic pretense to imply that there's anything practical about light sport airplanes. Few of them are used for travel and even fewer are flown in the kind of weather that a utilitarian airplane like a Bonanza or Cirrus has to tackle to earn its keep. So in reviewing LSAs, we're talking about big, expensive toys and that certainly applies to the Searey Elite.

If ever there were a pure sport airplane, the Searey amphibian ought to qualify. It's slow, doesn't carry much, isn't exceptionally comfortable and won't fly far. But it offsets all that with hell-for-leather fun that buyers looking for something different might find appealing.

The Searey began life as an amphibian kit aircraft, evolved to an ELSA and is now selling as a full-up SLSA as the Searey Elite, an upscale, glass cockpit version of what was once a bone-basic airplane. At a $158,000 base price, the Searey's sticker is about $25,000 higher than a typical land light sport, but less than the soon-to-be Icon A5 ($189,000) and way less than the $370,000 Lisa AKOYA. Since we last examined the Searey in 2009, the company has received an infusion of investment, built a new factory and evolved a new model, the Elite.

LONG HISTORY

As LSA companies go, Progressive Aerodyne has been around a while, having been formed by Kerry Richter and partners in 1992. Its experimental kits soon became dominant in the amphibian field simply because there weren't that many EAB flying boats. The company's Kevin Oaks told us Progressive Aerodyne has about 600 aircraft flying, most of them kits. But when we visited the company in November 2014, some six LSA versions of the Elite were on the assembly line and more are on the order books. Progressive Aerodyne is looking east for more growth, having established a sales office in Shanghai, through the efforts of Adam Yang, a Searey owner who became the CEO in 2011.

The company offers three models: The basic Searey Sport LSA, the Searey LSX kit airplane and the Searey Elite. Oaks told us the Elite is the top seller, confirming what's proven true in the LSA market: Buyers want top of the line.

And for a modest flying boat, the Elite certainly is that. As an upgrade from the Sport, the Elite has a turbocharged Rotax 914 at 115 horsepower in place of the 100-HP 912 used in the Sport. The additional horsepower provides a performance punch mostly in takeoff and climb, but it also improves the airplane's high elevation performance. No surprise that owners take these things into mountain lakes for an afternoon of fishing. The 914 makes that doable and probably with some reserve performance margin.

The cockpit and panel are what we have come to expect of high-end LSAs, which is to say a lot of glass and comfortable leather seats. Except they're not leather, but a marine-grade faux leather, since (a) they're inevitably going to get soaked and (b) you have to put your likely wet feet on them when boarding. But the material is designed to absorb the punish-

ment and in the demo we flew, the upholstery looked luxe enough to cause second thoughts about stepping on them. No worries, said demo pilot Daniel Nickens, so we planted both Nikes smack on the seat to ingress.

CONSTRUCTION

To understand the Searey's construction, think of a small open boat a little broader than a canoe, then close in the bow section with a cover. Then drop into the boat what sort of looks like a Hughes 300 helicopter, but with wings attached rather than rotors. That's a stretch, but it gives the idea.

The hull of the Elite is of carbon fiber and weighs about 85 pounds. The Sport's hull is fiberglass and is 25 pounds heavier. The Elite has a useful load of 445 pounds. The only through-hull fittings are for the landing gear and these are usually above the waterline.

The longitudinal structure of the airplane consists of a heavy-walled aluminum pipe—hence the Hughes reference—which runs from the back of the cabin to the rearmost end of the aircraft, where it provides structure for the retractable tailwheel and the empennage. The pipe terminates immediately behind the pilots' seats and ties into a structure that supports the wing's main spar.

Consistent with its kit antecedents, Progressive Aerodyne makes generous use of aluminum tubing throughout the structure. It's mostly bolted together with few rivets and no weldments and it's treated with linseed oil for corrosion resistance.

The channel aluminum wing rib trusses are riveted together and fastened to tubular aluminum spars. The gear legs? Steel tubes, with an aluminum fairing to give them more streamlining in both the water and the air.

With respect to the landing gear, the FAA had to relent on amphibious LSAs, allowing retractable gear. Progressive does this by a motor for each gear leg. Through a jackscrew, the motor simply raises the gear up in plane, sort of like a half jumping jack. The gear stows against the wing struts, well clear of the waterline. Through a cable arrangement, the left gear motor also raises the tailwheel, which is attached to the aforementioned tube, but is outside the watertight hull. To keep the hull interior dry, the hollow gear legs are plugged and the through-hull passage has a flexible boot. The wings have all-aluminum ribs and spars, with a metal leading edge and Polyfiber cover. There are no fuel tanks in the wings, however, so fuel is stored just behind the pilot seats in a heavy-walled, trapezoidal plastic tank with a 22-gallon usable capacity. Because the tank is below the engine, the fuel system is equipped with two electric pumps, which run continuously. The switches for them are placed prominently on the panel, along with the airplane's bilge pump switch.

The Elite's basic hull, right, is carbon fiber and has only two through-hull fittings for the steel-tube landing gear legs, lower left. Top-side structure is built around a robust aluminum tube with bolted tubular struts, top left. Fuel tank is just aft of seats.

CUSTOM GLASS

The Elite's main panel display is an Advanced Flight Systems 5500 which is programmed to remind the pilot he's in an amphib. Audible warnings nag to remind the gear must be up for a water landing and these force an intentional acknowledgement that the gear is down for a planned land landing.

These warnings are so incessant, in fact, that it's a minor annoyance. Better that, we suppose, than the indignity of turning turtle by landing in water with the gear down. At least four owners have done that and flipped. A fifth avoided that, but the hull was damaged enough to sink the airplane. When we flew with Daniel Nickens, he said pilots need to be obsessive about gear position and it's hard to argue the point. The center portion of the panel is occupied by a Garmin aera 696 or 796 and below that is a Garmin GTR 200 comm and a GTX 327 transponder.

The gear switch, with two prominent green down lights, the flap control, brakes and throttle are on the lower portion of the console between the two seats. The brakes are hand operated and control both wheels together, which takes some getting used to. The center sticks poke up from an indent in the lip of the seat and the stick itself has a PTT and a coolie hat trim button.

Creature comforts are adequate, but not luxurious. The airplane has a pair of sliding canopies, one for each side, and these don't latch but merely slide forward. Progressive makes the point that this design is a surer bet for egress in the event of a nose over than a conventional canopy would be and we agree. As noted above, a flip over

Searey interior, left and lower, is upholstered in marine-grade faux leather. Main PFD is a Advanced Flight Systems 5500 custom programmed for the Elite.

in an amphibian is far from a remote possibility, which is also the reason standard procedure includes donning personal flotation devices. A paddle is helpful too, to maneuver near docks, obstructions or in shallow water.

FLOATING IT

Taxiing a flying boat down a ramp and into the water requires a certain faith in the physics of buoyancy. The Searey sits low in the water, so much so that there's only about a foot of freeboard to the cockpit combing. A bit of a list and a boat wake could ship water into the cabin. Closing the sliding canopy will prevent that.

For water taxiing, Nickens told me it's common to leave the gear down so it acts as a sort of stabilizing keel, keeping the turns from becoming skid fests. With the pusher engine blasting air over the large rudder, the Searey can turn aggressively on the water and will go where you aim it. Just for fun, it can also do high-speed Jet Ski- style fast-taxi turns at 30 to 40 MPH. Sitting so low in the water, the speed in these turns seems much higher than it is and to keep the wing floats from digging in, you use opposite aileron against the turn. But if one does catch, the floats are protected by a breakaway plastic fitting that allows them to swing free, avoiding wing damage. The part is easily replaceable.

Water takeoffs require raising the gear after checking that the bilge is dry. Full back stick gets the hull on the step quickly and then you can all but release the back pressure, nudging the airplane off the water when it's ready. Although the Searey Elite isn't a fast airplane—figure cruise speed around 95 MPH—it does climb well and holds at least 800 to 900 FPM to medium altitudes, thanks to the 914's turbocharging.

The Elite has typical control forces—not as light as the Sport Cruiser or Remos, but lighter than the Groppo Trail we recently flew. Like other amphibs with high-mounted pusher engines, changing power yields a big pitch moment; down when power is added, up when it's reduced. But once that transitional thrust vector is gone, so is the pitch moment. It returns to the trimmed airspeed. We noticed that the Searey doesn't have a lot of up pitch authority, so it takes exertion to get it to stall. That nets a little bobble and a stable parachute mode if the pitch isn't relaxed.

Water landings require more of that taxi-down-the-ramp faith we mentioned. Because the airplane is so low in the water, the flare—what little is required—happens about two feet lower than you might expect. The airplane touches down almost flat and settles into the water off the step when the power is reduced. Or it can be speed taxied on the step. To shorten the roll out, yawing from side to side ramps up the drag, as does lowering the landing gear.

Although the Searey is a taildragger, the tail angle is so low that it doesn't really land like one on a hard runway. Visibility over the nose is good, so the landing sight picture is about the same as you'd expect in a nosegear airplane landing on the mains. Ground handling takes a touch. With just a single hand lever for both brakes, steering is via rudder and it requires aggressive inputs and maybe a blast of power to get turning after the tailwheel breaks loose to swivel. Practicing helps.

CONCLUSION

The Searey Elite is a competent, fun flying machine and there's no point in suggesting it's anything other than that. If you have a lake house, you could commute with it or do light camping and fishing at a secluded mountain lake. But otherwise, we're talking about as pure a recreational aircraft we can imagine.

Most of these airplanes—predominantly kits—live in hangars and are flown on water for sport. Although Progressive Aerodyne offers a wing-fold option, it's not meant to be a quick fold to trailer the airplane back and forth to the lake as Icon intends for the A5. The market for such a thing remains unproven. But the Searey's credible aircraft population certainly proves the appeal of the concept for those who can afford it.

CONTACT

Progressive Aerodyne
352-253-0108
www.searey.com

Garmin GDL84: Entry-Level ADS-B

Garmin's tablet-driven GDL84 ADS-B system targets basic aircraft with legacy avionics. We give it the edge for compatibility with aging transponders.

by Larry Anglisano

Let's assume you own a vintage Piper Cherokee, Cessna 172 or Grumman Tiger, to name a few entry-level rides. Perhaps it is equipped with a basic navcomm, older Mode C transponder and non-WAAS GPS—or no panel GPS at all because you fly with a tablet computer or portable GPS.

You've probably discovered the dilemma in finding a complete mandate-compliant ADS-B In and Out solution that won't require a complicated installation. Garmin is attempting to solve that with its new GDL84 ADS-B transceiver, a product that trickles down from the flagship GDL88 system.

The GDL84 is an ADS-B In and Out system that is partially wireless, doesn't need a panel display, a panel GPS, or a dedicated control head for channeling ADS-B squawk codes. Instead, it's controlled and displayed entirely on an iOS or Android tablet. Its also has a dual-link receiver for more complete traffic alerting.

For an approximate installed price of around $5500, is it the low-cost solution the lower end of the market has been waiting for? We think not, but it could set a precedent for simpler installations moving forward.

FLIGHT STREAM

To understand the main concept of the GDL84, you first need to understand Garmin's recently introduced Connext wireless interface and the Flight Stream Bluetooth transceiver. We covered the interface in the August 2014 issue of *Aviation Consumer.*

To recap, the Flight Stream 110 device functions as two-way wireless communications hub between Garmin weather transceivers, including the GDL69 XM receiver and the GDL88 ADS-B transceiver. Receiving data from these systems through a RS232 serial data stream, Flight Stream broadcasts the data throughout the cabin for display on Garmin's Pilot tablet app, compatible with iOS and Android tablets.

The higher-tier Flight Stream 210 system, which has integral AHARS, transmits flight plan data from the tablet into the panel navigator and overlays flight instruments on the tablet.

Flight Stream is an integral component to the GDL84 and Garmin includes the entry-level 110 device in the GDL84's $3995 list price. Also included is an ADS-B mandate-approved WAAS GPS receiver and external antenna. It doesn't include a required L-Band blade antenna for mounting on the underside of the aircraft. Unlike the GDL88, the GDL84 isn't available

The GDL84 budget ADS-B transceiver, top photo, won't work with panel displays. Instead, it's designed to transmit dual-link ADS-B traffic, plus weather data to an iPad or Android tablet that's running Garmin's Pilot app, bottom photo.

CHECKLIST

- Flight Stream Bluetooth hub kicks the interface potential to a higher level.
- Wireless interface with legacy Mode A/C transponders via interrogation.
- Antenna work, tablet hardware raises costs.

The Garmin Flight Stream 210 Bluetooth transmitter, far left, points toward the direction of flight because it has an internal AHARS. It also transfers flight plans between the tablet and panel navigators. FreeFlight's more basic WiFi module, left, is limited to display of ADS-B data on iOS tablets.

with dual antennas (top and bottom) for Diversity. Dual antennas can be effective in interfaces that suffer from structure shadowing, where landing gear doors or other airframe structure might block the signal.

WIRELESS INTERROGATION

A key element of the GDL84 is its streamlined transponder interface and its ability to function wirelessly with legacy Mode A/C models, including the King KT76A, Narco AT150 and Collins TDR950, to name a few. This is welcomed compatability in aircraft that still have older transponders, since ADS-B Out still requires a traditional transponder.

Mandate-compliant ADS-B interfaces require that the ADS-B device broadcast a squawk code and ident in the same fashion as a typical transponder. All 1090ES Mode S transponders (Garmin's GTX330ES and Avidyne's AXP340, for example), do this automatically, in addition to streaming ADS-B data.

But non-1090ES, remote ADS-B devices like the GDL84 UAT and FreeFlight RANGR UAT transmitters are tasked with synching to the onboard Mode A/C transponder pulses to transmit the same code and ident status.

One solution is to install a dedicated control head for the UAT ADS-B device (needed with FreeFlight's RANGR device), requiring the pilot to set the same squawk code for both devices. If these codes aren't synchronized, ATC will see two aircraft occupying the same space.

The obvious dowside to a separate control head is the required panel space, panel work and additional pilot workload.

Digital, computer-controlled transponders that have serial data outputs enable this code synchronization through electrical cross-communication, eliminating the second control head. This wiring interconnect isn't possible, however, with legacy analog transponders.

As a solution, Garmin designed the GDL84 (and flagship GDL88) with a low-power, 1030 MHz transmitter that interrogates the ownship transponder. In turn, the transponder responds to the GDL84 with the Mode 3/A code, allowing the ADS-B device and the transponder to always remain in synch. Whenever you change a code on the Mode A/C transponder, the GDL84 automatically reads it. This interrogation imitates interrogations received from ground-based radars, causing the transponder to reply with the current squawk code, ident status and even emergency status.

This interface also reduced the installation complexity and cost, since the ADS-B transceiver doesn't have to be wired with the transponder or altitude encoder.

DUAL-LINK BENEFITS

The GDL84 and GDL88 transceivers are dual-link systems, a sizable benefit for obtaining a more complete traffic picture. The FAA's mandate complicates matters.

If you fly above 18,000 feet, the ADS-B mandate requires the aircraft to broadcast on 1090 MHz. Below 18,000 feet, you can satisfy the mandate by broadcasting ADS-B on either 1090 MHz or 978 MHz frequency bands. This creates a compatibility issue, since aircraft are broadcasting

GDL84: ADDING UP THE EXTRAS

Don't underestimate the complexity and cost that tags along with ADS-B antenna work, especially for fabric and composite aircraft. The top of the Legend Cub in the photo to the left is already tight on antenna real estate. Example pricing below is for basic installations.

GDL84	978/1090 ADS-B transceiver, GA35 WAAS antenna, install kit	$3995
Flight Stream110	Bluetooth transceiver, installation kit	included
CI-105	L-Band, bottom-mount blade antenna	$150
GARMIN PILOT	Tablet data subscription, VFR only	$75
INSTALL LABOR	Install WAAS GPS antenna, L-Band antenna, mount and wire GDL84 transceiver and Flight Stream, prepare regulatory paperwork, flight test	$1320
TABLET COMPUTER	iPad or Android, basic mount, anti-glare screen cover	$700
TOTAL	Fly away compliant with 2020 ADS-B mandate	$6240

Estimated pricing doesn't include discounts on equipment, represents 12 hours of labor and 1.5 days downtime billed at $110 per hour.

MANDATE-COMPLIANT, CERTIFIED ADS-B TRANSCEIVERS

COMPANY/ PRODUCT	ADS-B SPECS	INTERFACES	PRICE	COMMENTS
BENDIXKING KGX150	SINGLE-BAND 978 UAT ADS-B OUT, IN	ADS-B COMPLIANT MFDS, TABLETS THROUGH WIRELESS	$4418	Has integral ADS-B mandate-compliant WAAS GPS and optional wireless interface (system is repurposed from FreeFlight RANGR). Versions available without GPS.
GARMIN GDL84	DUAL-BAND ADS-B IN, 978 UAT ADS-B OUT	IOS, ANDROID TABLETS RUNNING GARMIN PILOT	$3995	Sold with the Garmin Flight Stream 110 Bluetooth transmitter for tablet ADS-B display and internal WAAS GPS. Can be upgraded to the GDL88 for panel display interface, and upgraded with Flight Stream 210 device.
GARMIN GDL88	DUAL-BAND ADS-B IN, 978 UAT ADS-B OUT	GARMIN ADS-B COMPATIBLE PANEL DISPLAYS, IOS AND ANDROID TABLETS	$5995	Several versions are available. This includes versions with and without internal GPS and dual (diversity) antennas. GDL88 is compatible with Flight Stream and with Garmin panel displays.
FREEFLIGHT SYSTEMS RANGR 978-XVR	SINGLE-BAND ADS-B UAT TRANSCEIVER	ADS-B COMPLIANT MFDS, TABLETS THROUGH WIRELESS	$3995	Available in three different configurations: ADS-B output only, output and input, or input only. Also available with or without GPS. * Includes WiFi module for iPad FIS-B display.
NAVWORX ADS600-BG	SINGLE-BAND ADS-B UAT TRANSCEIVER	ADS-B COMPLIANT MFDS, TABLETS THROUGH WIRELESS	$3295	Has internal WAAS GPS and is available with an optional WiFi adapter for tablet interface and Arinc adapter for panel interface. Adapter required for use with older transponders.

ADS-B on different channels.

The fix for this dual-link environment is ADS-R, for rebroadcast, which takes the signal from one link and translates it so the other link can interpret the data. For example, when two aircraft are in the service volume for a particular ground station, and one is transmitting on 1090 MHz and the other on 978 MHz, the ground station retransmits the data from each aircraft to ensure the two aircraft can see each other as traffic targets. But there's still a snag. You'll need to be within the service range of a ground station to receive the rebroadcast.

The GDL84 is capable of receiving ADS-B traffic data directly on a 1090 MHz data link, in addition to traffic reports and FIS-B weather uplinks on the 978 MHz data link. This allows the GDL84 to directly receive all ADS-B position reports from aircraft in its vicinity without relying on a ground station rebroadcast.

The GDL84 provides aural and visual cues of impending traffic conflicts, to include directional aural alerts—"Traffic, Traffic, Two o'clock, Two Miles, Low"—for example.

The Garmin Pilot app enables display of traffic symbology on various moving maps and on a dedicated traffic page.

You also get FIS-B weather overlay, to include Nexrad radar, METARs, TFRs, PIREPs, winds and temperature aloft, SIGMETs and AIRMETs.

SIMPLER, NOT SIMPLE

As close as the GDL84 comes to a wireless interface—with its tablet display and self-interrogation—it still requires a sizable installation. Garmin's Bill Stone told us basic installations might be completed in eight hours, but we suspect 12 hours—or 1.5 working days—is more realistic, but depends on the experience level of the installer and the complexity of the aircraft.

What's involved? First is finding a location to mount the remote transceiver, which is roughly six inches high, seven inches deep and weighs about four pounds, including the mounting racks and connectors. Then, it must be wired to the electrical bus through a circuit breaker for power. The GDL84 is also wired to the Flight Stream transceiver.

The GDL84 breathes new life into legacy avionics, including older analog transponders, left.

The system requires two sensors, the included WAAS GPS antenna and the installer-provided L-Band blade antenna. As mentioned in the sidebar on page 12, antenna work will vary from airframe to airframe, depending on the type and condition of the aircraft interior and how difficult it is to route coaxial cable.

The GDL84 also requires an ADS-B status/failure annunciator light mounted on the panel and the audio interface. Still, we don't think fly-away prices in the $5000 range (not counting tablet computer hardware) will be unheard of, after shop discounts.

If you're waiting for an entirely portable mandate-compliant ADS-B system—particularly one that can be taken from aircraft to aircraft or used in aircraft without electrical systems—don't hold your breath. Garmin's Stone said such a system wouldn't be practical because the ADS-B broadcast data includes aircraft-specific addressing and customized programming.

When we looked at approved ADS-B systems in the July 2014 issue of *Aviation Consumer*, we favored the FreeFlight 978-XVR system, which also has a tablet computer interface. But it requires a dedicated control head when installed with legacy transponders—a hurdle the self-interrogating GDL84 solves—with the added utility of the Garmin Connext.

Visit www.garmin.com, 800-800-1020.

In-Flight Icing Training: Ground Only for Most

Even though icing causes 10 percent of weather-related accidents, training in icing in non-FIKI aircraft is illegal. Here's what you can do about it.

by Rick Durden

Training to handle in-flight icing is one of aviation's worst Catch-22s: Most pilots fly airplanes that aren't certified for flight into known icing—therefore it's illegal to take dual to get experience in ice in those airplanes—so the first time a pilot gets into icing conditions, he or she is all alone in of the most complex situations in aviation.

The FAA's "just say no" to flight into icing approach is not rational given that, according to an AOPA study of NTSB data, icing accounts for 10 percent of all weather-related accidents and 22 percent of fatal weather-related accidents. With those kind of odds, it would seem that a pilot who flies IFR where there's a risk of airframe icing would do his or her utmost to get hands-on experience in dealing with ice in the type of airplane she or he normally flies.

The burning question is: Because the FARs prohibit a pilot from intentionally flying an airplane that is not specifically approved for flight into known icing (FIKI) into forecast icing conditions, and because pilots wind up in ice in non-FIKI airplanes, how can they best prepare themselves so as not to star in an NTSB report? To answer that, we'll look at what training is and isn't available, the risks of flight into ice in non-FIKI airplanes, and make recommendations as to the best training available.

FLIGHT TRAINING

We asked flight schools whether they gave flight training in actual icing conditions. The Part 141 schools referenced their training for the instrument or ATP ratings as the only time that there would be any reason to give training in actual adverse weather conditions. Each one we spoke with said that they did not have FIKI-equipped training airplanes on their flight lines. Therefore, there was no way that they were going to engage in flight training, intentionally, in forecast icing conditions.

With visions of the icing-induced Colgan Airways crash in Buffalo, New York, in 2009 and the need for icing experience for professional pilots, we wanted to know more than the "official" answer at Part 141 schools. We sought to find out whether there might be any sort of "we aren't going to do it, nudge, nudge, wink, wink" going on and whether students who really wanted to get some experience with icing could get it *sub rosa*. After making discreet inquiries we concluded the chances were near zero.

Travis Klumb, Director of Flight Standards at Cirrus Aircraft and a graduate of a Part 141 flight program summarized what we learned—that the students and instructors are there because they want to get a job with the airlines and they do not want to risk having a violation on their records, so they are not going to go outside Part 141-approved instruction syllabi and the FARs.

Part 61 training is a different story. For a pilot working on an instrument or ATP rating or an aircraft owner seeking instruction in her or his airplane, training in actual icing conditions is available. However, it's going to be on an instructor-by-instructor basis, on the quiet and probably with

CHECKLIST

- There is no legal way to get in-flight icing training in non-FIKI airplanes.
- Most flight school simulators do a poor job of simulating icing effects.
- There are some exceptionally good ground icing training courses.

Screenshot from NASA's online course, A Pilot's Guide to In-Flight Icing, showing ice accumulation on a Twin Otter wing.

the school or FBO loudly announcing that such illegal training does not go on at its facility.

Our observations and interviews (CFIs were not willing to go on the record) led us to the conclusion that instructors who have been around the block, especially in the northern U.S., believe that giving instrument pilots experience in actual icing conditions, in the type of airplane they normally fly, is of great value to the pilot.

Most were aware of the NASA research that shows that even small amounts of certain kinds of ice can have very large, negative effects on the lift and drag of some airplanes—so there is a very real risk. Yet they told us that they were of the opinion that a pilot who has had some experience in actual icing conditions (rime or mixed only, none would intentionally operate in clear icing) were better able to make informed decisions whether to depart on a proposed flight as well as what to do if they encountered ice in flight.

We emphasize that such instruction is not legal under the FARs and that there is a risk of serious injury or death if one intentionally accumulates any amount of any type of airframe ice on a non-FIKI airplane. We do NOT recommend training in actual icing in non-FIKI airplanes.

SIMULATORS

Victor Veltze, a sales representative with Frasca, told us that Frasca simulators are built to the demands of each training operator and some icing simulation can be included. He also said that, for simulators and icing performance, the issue in design is the icing model that is used—and there may not be a satisfactory model for a non-FIKI airplane.

In speaking with instructors who trained in the Redbird and Frasca simulators, we were told that the sims tended to overreact to icing. One said that the sim at his school "fell out of the sky," and that the simulation was not realistic. Because of the lack of accurate icing models for non-FIKI airplanes, realistic flight simulation isn't currently available.

We cannot recommend any simulator for icing training and are concerned that their overreaction to ice may make training in them counterproductive because they could encourage rash rather than rational decision making by a pilot on a first-time ice encounter.

GROUND TRAINING

Now that we've gone through the bad news—here's the good news, and it's good indeed. We surveyed free web-based interactive and video ground training programs. We found five that we recommend—three of which are exceptionally good.

NASA's cutting edge icing research in a Twin Otter at its Glenn Research

CIRRUS: SMART FIKI ICING TRAINING

As we researched icing training for owners of non-FIKI airplanes, we generally found that owners of FIKI airplanes could get training in actual icing conditions without too much trouble. Organized courses are not common—although instructors and organizations sometimes include training in actual icing conditions as a part of the checkout process. Also, owners who took recurrent training in their airplanes sometimes worked with their instructors to pick up some ice while doing so.

What we did find as an example of a dedicated FIKI training program for owners and an organization absolutely willing to train in actual icing conditions was Cirrus Aircraft. We were aware of Cirrus's aggressive approach to flight training, but only learned about its icing training when speaking with Travis Klumb, the Director of Flight Standards at Cirrus.

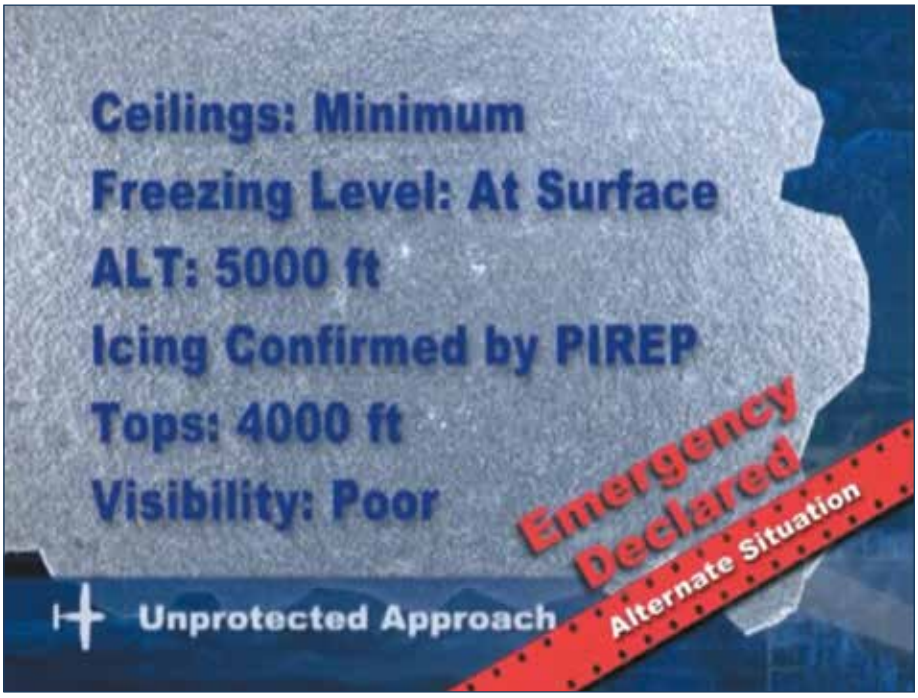
Klumb explained that virtually all individual sales of Cirrus aircraft in the U.S. are now FIKI airplanes (non-FIKI generally go to flight schools and overseas). He said that Cirrus wanted a way to help owners learn how to use the TKS on their airplanes, operate in icing, develop strategies for dealing with it, especially under those circumstances where the aircraft will have to be in ice for an extended time.

The intent was to help owners minimize the risks presented by icing both when they were doing preflight planning and in flight. Klumb said that "Cirrus is big on real-life training."

Cirrus provides FIKI aircraft flight training in icing conditions in its Cirrus Headquarters Training in Duluth. Klumb told us that for its cadre of Cirrus Standardized Instructor Pilots (CSIP) around the country, it leaves the decision whether to give such instruction up to each individual instructor.

Cirrus also created the "Cirrus Icing Awareness Course," on online, interactive icing training program tailored specifically for FIKI Cirrus aircraft. Cirrus is so serious about the value of training and recurrent training that the limitations section of the POH on its FIKI aircraft includes a requirement that the pilot in command have completed the Icing Awareness Course within 24 months before operating the aircraft in icing conditions. It is illegal to fly a FIKI Cirrus containing that POH limitation into known icing conditions unless the PIC has completed the online course within two years.

We went through the course and were impressed. We think highly of the NASA online icing course; the Cirrus course is as good or better. It includes the NASA research information on icing as well as detailed operational info on TKS and its limitations, something not in the NASA course. The course is free to FIKI Cirrus buyers.



Screenshots, AOPA Precipitation and Icing course, above left and NASA's video, Icing for General Aviation Pilots.

Center in Cleveland—one of the worst places for ice in the U.S.—is the basis for most of the courses. We think NASA's research and its willingness to aggressively publish in a consumer-friendly form has saved lives. Sort makes a person happy to be a taxpayer.

We highly recommend NASA's two web-based, interactive icing courses, "A Pilot's Guide to Ground Icing" and "A Pilot's Guide to In-Flight Icing" http://tinyurl.com/9zut3. The first is designed to give detailed information to pilots about the types of icing that result from weather activity while the airplane is parked in the open and how to deal with it. The second, on in-flight icing, is the most complete ground school on the subject we've ever seen. Depending on how many of the associated videos and additional information icons one clicks, completing the densely packed course takes between four and six hours.

The course includes detailed discussion of types of icing that may be experienced, with excellent photos, the most recent research on the phenomena of super-cooled large droplets (SLD), how they can quickly overwhelm any deicing system and how they were never considered when the regs were written for FIKI certification. As would be expected, the course includes operational scenarios and quizzes based on scenarios—but they aren't the usual yawners we normally see in aviation training courses—they are well thought out, realistic and require serious thought to answer.

We also recommend NASA's 55-minute YouTube video, http://tinyurl.com/mdtmgdj, entitled "Icing for General Aviation Pilots." Beginning with a gut-churning recreation of an actual severe icing event, it segues into passing along excellent icing information and strategies for dealing with it through realistic scenarios (the acting is a little stilted) involving two flights in the Great Lakes area, one FIKI and one non-FIKI. As each flight progresses, what we consider to be good alternate situations are tossed in to create a number of "what if" deteriorating weather events.

Near the end of the video, the outcome of the severe icing event is unveiled—we won't spoil it for you.

For a good, compact icing guide that can be kept handy on a tablet or printed out, we recommend the AOPA Air Safety Foundation's "Safety Advisor, Weather No. 1, Aircraft Icing" pamphlet, http://tinyurl.com/q4ukocw. While it does not go into the depth of the NASA presentations, it is a solid introduction to the subject, uses a number of NASA photos and describes some real-life events to show that it's not just theory.

Finally, we have always liked the Safety Education Online Courses available on the AOPA's website. For icing training, we recommend the course "Weather Wise: Precipitation and Icing," http://tinyurl.com/nt7rlm5. It takes about 30 minutes to complete and provides a solid introduction to the effects of inflight icing, although the quiz portion is only mediocre.

CONCLUSION

We are aware that pilots in the northern U.S. often intentionally fly through layers of stratus clouds, knowing they will collect some ice. They learn about ice via the school of hard knocks rather than in an organized, safe fashion.

Given the number of icing-related accidents of non-FIKI general aviation aircraft, we are deeply concerned about the absence of a legal way for pilots of those aircraft to get hands-on training so that they can make well-informed decisions about dealing with it safely. In our opinion, this is a gaping hole in the FAA's obligation to increase the level of flight safety—especially as no simulators exist that can reasonably duplicate the behavior in ice of the airplanes that most often collect it. We, nevertheless, do NOT recommend non-FIKI training in icing conditions.

For excellent ground training, we cannot recommend too highly the NASA online icing course and its YouTube video. We also recommend the AOPA ASF icing pamphlet and online course.

SiriusXM SXAR-1: Broadcast WX For iPad

SiriusXM's satellite weather receiver brings wireless Broadcast weather to the iPad, but its interface is limited to WSI's Pilotbrief app.

by Larry Anglisano

CHECKLIST

- ⊕ WSI Pilotbrief for iPad excels at weather graphics and has a logical layout.
- ⊕ Wireless interface eliminates pricey receiver and display installation.
- ⊖ Pilotbrief has limited navigation features. That means flipping between it and your favorite app.

Responding to blistering competition from a handful of free ADS-B weather apps and receivers, SiriusXM is out with the new $699 SXAR-1 portable Broadcast weather and entertainment receiver. The receiver wirelessly streams WSI weather data directly to the iPad, eliminating the need for a panel display or portable GPS.

As tablet computers replace portable GPS systems, SiriusXM faces a hardware problem. Garmin's market-saturated GXM-series puck-style XM weather receivers will only work with Garmin portables, plus the majority of them won't receive new weather packages and lower subscription costs. That's not sitting well with some subscribers.

While Garmin released the next-generation GXM42 receiver early last year (we covered it in the March 2014 issue of *Aviation Consumer*), we think the interface started out stale because the wired receiver isn't directly compatible with tablets.

The other half of the interface is the Pilotbrief Optima iPad app from WSI—a program that supports the company's own weather data that's delivered by SiriusXM. While we're impressed with the weather graphics, performance, reliability and feature set, a third-party app interface and more navigation features could add more utility and lower-end market appeal—a shrinking market, we believe.

HARDWARE, SOFTWARE

Roughly the size of a fat smartphone, the $699 SXAR-1 satellite receiver is 5.0 by 2.7 by 1.2 inches, weighs roughly one pound and has a non-skid base. Marketing data says it has "easy portability and placement on dash," but we wouldn't want to be within its trajectory during a crash.

Controls are limited to a power button and power cable input on the side of the case, plus four status annunciators on the top of the case. These show the status of power, satellite reception and Bluetooth connectivity.

We found the receiver works fine while resting on a seat and stashed in a flight bag that was in the back seat. Although the device has an integral SiriusXM and GPS WAAS receiver/antenna, it can accommodate external antennas that plug into the case. We didn't need to use them.

The SXAR-1 is compatible with the iPad 2 and newer tablets, including the mini. Off to a frustrating start, we experienced Bluetooth connectivity problems and random app crashes when trying to use the device with iOS 8.0. These issues were solved with iOS 8.1.1, an update recommended by SiriusXM's engineers. The WSI Pilotbrief app is not compatible with Android devices.

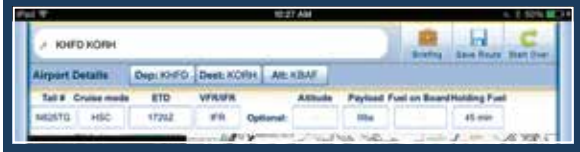
The SXAR-1's rechargeable battery has reasonable endurance. We were able to stretch it out for seven hours between charges.

The Pilotbrief Optima app for iPad trickles down from the Pilotbrief

The SXAR-1 satellite receiver connects with the iPad via Bluetooth, right. The receiver sensitivity is good enough to plop the device on the seat and compact enough to place it on top of the glareshield.

PILOTBRIEF FOR IPAD DISSECTED

Clockwise from upper left: Once airports are entered or a flight plan is selected, you gain access to current METAR data by tapping on a METAR plot on the map. When the Airport WX layer is active, Airport Details displays METAR, TAF, winds and temperatures aloft, plus NOTAMs for the selected airport. A Graphical Turbulence slider maps the potential turbulence at various altitudes, from light to extreme. This is color-coded on the map in four shades of purple. SiriusXM Satellite Radio is streamed from the SXAR-1 via a separate Bluetooth link. It requires an optional entertainment subscription, but is controlled from the Pilotbrief app. The app's main menu and weather overlay tabs are the bottom of the screen, while flight planning data is at the top.



desktop program. You've likely used the WSI application in an FBO flight planning room and many of its features carry into the iPad app, including radar and satellite weather charts and summaries.

WSI's Eric Jean rattled off no fewer than four major airlines that use the WSI weather service, while making it clear that the Pilotbrief app has roots in the corporate and commercial market. That's one reason why the app doesn't come out of the gate with expected features like along-the-route fuel pricing—a feature that general aviation users have grown to expect from other apps. Still, WSI isn't new to the lower-end market.

Remember that it developed the Inflight satellite weather system and the AV-series receiver. It interfaced with the Apollo MX20 MFD, and unofficially with early Garmin GNS430 navigators through an RS232 connection.

We found the Pilotbrief's menu structure easy to get along with in short order. The menu bar at the bottom of the app has a download manager tab for downloading aeronautical charts, airport and navigational data. This includes low and high IFR charts, plus VFR sectional maps for the continental United States. While you can view these charts when connected with the SXAR-1 receiver, they must first be downloaded over an Internet connection.

The Pilotbrief app works with the Dual XGPS170 ADS-B receiver, left, but doesn't display ADS-B traffic.

The app has three connectivity modes—Internet (or 3G/4G data), the SXAR-1 receiver and ADS-B, through the Dual Electronics XGPS170 portable ADS-B receiver.

Any of the approach and departure procedures/plates that you download online will also be available in the app's inflight mode. While ownship data and a courseline between waypoints in the flightplan appears on sectional and IFR charts, the approach charts are not georeferenced, and nav features are limited.

The Map tab brings up the mobile interactive map and it enables overlay of various weather products—called layers—on top of a base map or aeronautical chart. If location services are turned on in the device, the map is automatically centered over the current position, based on the WAAS GPS inside the SXAR-1 receiver. The map has panning and familiar pinch-and-zoom touch functionality, and we were impressed

at how efficiently and quickly the app ran on a new iPad mini 3.

A long tap of the map executes a geo-search for airports, waypoints and navaids within 50 miles of your position, and there is the option of adding the waypoints to the active route.

The Map tab has an option for calculating and filing flight plans through DUATs. First, you create an aircraft profile for saving in the app for optimized route building. Select the departure, destination and alternate airports, in addition to departure time, and flight plans can be created and filed directly from the app. VFR flight plans require a DUATs credential, but IFR flight plans do not. Once a flight plan has been filed, it can be retrieved from a "recently filed" slideout panel on the left side of the map page.

WEATHER LAYERS

A secondary menu bar has a layers icon for selecting weather graphics for overlaying on the map. The drop-down menu is simple and lists the available products and time stamp of the data. The chart to the right has a complete list of WSI-sourced weather products that are inclusive with a given SiriusXM Aviation subscription plan. The new SXAR-1 receiver won't receive weather sourced from Baron Services WxWorx.

Our evaluation was with the flagship Pilot Pro, which gained access to Base Reflective Radar, Composite Radar, Cloud Top, Echo Tops Raster and Graphical Turbulence products. These are found in the Layers drop-down menu under the Radar and Satellite submenu. Simply tap the product you want to overlay, while the Map Settings tab changes the map layer. A Layers Transparency slide control does just that—it creates transparency so you can see the base map through the weather graphics. This can be a handy feature when viewing a busy radar image.

There is a dedicated menu tab for turning on HD Radar, HD Satellite, Radar Summary, Lightning (from WSI's Global Lightning Network) and WSI SIGMETs. To the left of these tabs are controls for looping the images, including past and future radar and satellite pictures.

The Pilot Express subscription plan includes WSI's base reflectivity radar data. This is the image produced from the first scan of the radar site when the antenna is at its lowest elevation tilt. The Pilot Preferred and Pilot Pro subscription includes the base reflectivity radar images in addition to composite reflectivity radar images. Think of composite reflectivity as the strongest reflected energy (maximum dBZ) at all tilt angles in a radar volume scan.

It's worth considering resolution and bandwidth signatures of the radar data compared to free FIS-B data. When streaming the data from the internet, WSI says you can expect 1 Km resolution, but data from the SXAR-1 receiver is lower. Exactly how much lower is unknown because SiriusXM said they don't publicly share resolution specs. They did say the resolution is better than FIS-B radar, which is variable due to limited bandwidth and compression issues, but does meet certain specs. This includes a spatial resolution equal to or better than 2.2 km for the Regional Nexrad precipitation reflectivity product, and 10.6 km for the continental U.S. (CONUS) Nexrad. WSI kept the inflight radar coloring as close to the same as it appears online, but with less colors.

One feature that we found intuitive and useful is Graphical Turbulence. When activated, a graphical turbulence slider control appears at

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SIRIUSXM AVIATION SERVICE LEVELS

PACKAGE CONTENTS	Pilot Express $34.99 month	Pilot Preferred $54.99 month	Pilot Pro $99.99 month
Base Reflective Radar	✔	✔	✔
Composite Reflectivity Radar		✔	✔
NEXRAD storm cell attributes	✔	✔	✔
Radar coverage map	✔	✔	✔
Observed lightning strikes	✔	✔	✔
Temporary flight restrictions (TFRs)	✔	✔	✔
Winds aloft (including graphical depiction)	✔	✔	✔
AIRMETs/SIGMETs/PIREPs	✔	✔	✔
Temperatures aloft	✔	✔	✔
Standard forecast winds	0 hours	0-24 hours	0-48 hours
High resolution forecast winds	0 hours	0-3 hours	0-24 hours
METAR, TAFs CONUS	✔	✔	✔
METARs, TAFs non-CONUS		✔	✔
Wind shear		✔	✔
Cloud top imaging		✔	✔
Surface visibility forecast		0-1 hours	0-3 hours
Graphical turbulence guidance			✔
Freezing level/forecasting time		0-1 hours	0-3 hours
Icing NOWcast			✔
Convective outlook			✔
SiriusXM Radio programming	Optional	Optional	Optional
One-year prepaid subscription	$384.89	$604.89	$1099.89
Two-year prepaid subscription	$734.79	$1154.79	$2099.79

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Engine Isolators: Vibration Protection

Among the least-known components in your airplane, the engine isolators save the airframe from the engine. Here's what they do and how.

by Rick Durden

Engine mounts have it tough. The elastomer doughnut-looking things that live between the engine and airframe to prevent the vibration of the ironmongery up front from beating the rest of the aircraft to flinders not only live in a harsh environment, they are generally forgotten after being installed and are subject to an ongoing identity crisis.

For one, people can't seem to agree what to call them. To most, they're engine mounts—yet that name also refers to the metal structure that joins the engine to the airframe. Vibration isolators is more technically correct, and we also have heard them referred to as isolators, engine isolators, vibration controllers, and—as Kleenex is used for tissue and Learjet for corporate jets—Lord mounts.

We're going to use engine isolators because that's what the gizmos are intended to do—isolate the rigid airframe from the hammering vibration of the engine and propeller. We'll explain how they do what they do, how long they can be expected to last, what they cost and what can go wrong when they wear out.

BACKGROUND

An engine and propeller combination creates a hideously complex series of vibrations in normal operation. After flying his nearly turbine-smooth Cessna 185, we interviewed professional vibration analyst Steve Gruenberg to get background on the nature of vibration and what it can do to airplanes. He said to "think of all vibration as impacts. You just took your hammer and hit the airframe."

To make matters more challenging for aircraft designers, "the ideal aircraft structure is lightweight, so it will fly and stiff, to maintain the integrity of the control surfaces. It is the perfect conduit to transmit vibration and shock the length of the vehicle." That's according to Paul Furhman, senior marketing manager of Lord Corporation, the oldest manufacturer of aircraft vibration isolators (think Lord mounts). He explained to us that it's easy to break the transmission path of vibration on a ground vehicle, but difficult to do with an aircraft. The only way that has been found is to "use elastomeric engine mounts" (isolators).

Vibration from the powerplant(s) does nothing positive for the aircraft or its occupants—it leads to cracking of the structure, loosening of rivets, metal fatigue, damage to instruments and fatigue for the occupants.

The Lord Corporation pioneered the development of rubber vibration isolators (it called them mounts) for aircraft prior to World War II. As general aviation popularity skyrocketed following the war, Lord developed stiff, natural rubber conical mounts for general aviation aircraft that Furhman said were effective in protecting

Since engine isolators are partially made of rubber, left, they'll eventually deteriorate.

CHECKLIST

- Engine isolators increase the life of the airframe and components.
- If inspected and not abused, isolators generally last 10 to 12 years.
- Worn-out isolators can lead to expensive damage to the airframe.

the airframe and instruments from engine vibration. However, they were not very good in damping vibration frequencies that were uncomfortable for the occupants. Furhman said that the vibration in the yoke or stick was often bad enough to cause the pilot significant discomfort over the course of a flight.

In the process of improving its isolators, Lord applied the Dynafocal mount it had developed in the early 1940s to general aviation. The engine mount itself was shaped to point the isolators at the center of gravity of the engine, vastly improving vibration damping. It also mixed other compounds, notably silicon, in with natural rubber, created isolators that were softer—to absorb more vibration at more frequencies—and had improved durability and heat resistance.

MAINTENANCE

Most engine mounting systems use four isolators, although some Cirrus aircraft use six. The Continental engine mounting system supports the engine from below—think of a person holding a beach ball. Lycoming engines are cantilevered out from the firewall, so the top isolators are loaded in tension, the bottom in compression. The isolators must be installed with the correct orientation. Scott Utz, proprietor of Arapahoe Aero at Denver's Centennial Airport, told us that from time to time his shop will get an airplane in with the isolators installed backward.

In general, aircraft and isolator manufacturers say the isolators will last through engine TBO. In operation, we were told by Utz and by Derek DeRuiter, proprietor of Northwoods Aviation in Cadillac, Michigan, that if the airplane is flown frequently, the isolators will last through TBO. However, it's more realistic to think of them as good for 10 to 12 years. They should be inspected for condition regularly. They are all made of a compound based on natural rubber, which means that they will eventually solidify and deteriorate.

Heat, oil and avgas are the natural enemies of isolators. Heat shields are usually installed in front of isolators that are near turbochargers or exhaust pipes—any time the cowling is removed, a quick check to see that the heat shield is in place is a good idea. Scott Utz told us that it's common for the isolator located nearest the engine oil dipstick to be the first of a set to degrade. This is because pilots routinely allow a few drops of oil to drip when checking the oil quantity and it finds its way to the isolator.

As the isolators wear out, the

Twin Barry isolators on a forward mount of a Cirrus SR-22T, one of the few airplanes that uses six isolators.

DESIGNING ENGINE ISOLATORS

Paul Fuhrman of the Lord Corporation (founded by Hugh Lord in 1924) gave us a simplified explanation of what is involved in designing a device that will effectively vibrationally isolate the airframe and engine of an airplane.

Step one is ground vibration testing of the airframe to find its natural vibrational frequency. Every object has a natural resonant frequency—think of a tuning fork. All engine isolation systems are designed to prevent the suspended mass—the engine and propeller—from exciting the resonant frequency of the airframe. Doing so will cause everything from discomfort to the occupants through damage to the airframe and components.

The next step is to determine the natural frequencies of the suspended mass—all suspended masses have six natural frequencies: fore/aft, vertical, lateral, roll, pitch and yaw. In an airplane they must be identified and isolated so that they do not go into the resonate frequency of the airframe. That becomes challenging because the engine operates at different speeds and frequencies during start, idle, taxi, takeoff, cruise, descent, landing and shutdown. Some of the frequencies are quite low.

Naturally, what is right for one airframe and engine combination isn't going to be correct for another—in fact, going from a two- to three-blade propeller changes the frequencies of the engine/propeller combination enough that it may require different isolators.

Added to the challenge is that the engine may only be allowed limited motion within its mounting system because of the demands of maintaining a consistent thrust line.

The manufacturer must take all those factors and design a mount that is soft enough to isolate the engine/propeller combination vibrationally from the airframe and keep the occupants comfortable. Additionally, to some extent, allow for such changes as may be made to the airplane downstream, such as aftermarket air conditioning, an add-on turbocharger or a modified exhaust system.

Lycoming engine mounts are cantilevered out from the firewall, loading the top isolators in tension and the bottom in compression as on the Beech Duke, far left. Bottom left Lord isolator on the same Beech Duke, left. A Cirrus with sagging engine due to worn isolators shows greater gap between prop spinner bulkhead and cowling at top as compared with bottom, lower photo.

engine will sag on the mounts and vibration will get worse. As the engine sags it can and will come into contact with the cowling and items within. Common results are the engine ring gear cutting into the lower cowling and chafing of wires and fuel lines. For reference, the cure date is stamped on each isolator.

When the engine begins to sag in the mounts, the aft side of the prop spinner bulkhead will no longer be parallel to the front cowling opening.

Lord publishes guidelines for cleaning and inspection of Lord mounts (isolators) that generally apply to all isolators: wipe oil and dirt off them, do not dip them in cleaning solvents, check bolts and spacers for cracks and damaged threads, and examine bonded rubber isolators for swelling, bond or rubber separation and shear or compression set.

Isolators that show bond separation, oil swelling or flex cracks should be replaced as should those that exceed Lord's published maximum allowable tolerances for compression and eccentricity. Replacing a set of isolators takes anywhere from three to 12 hours. It involves loosening mounting bolts and hoisting the engine a few inches away from the mount, and then loosening or moving cables and lines as needed. Once there is adequate clearance, the bolts can be withdrawn and the replacement isolators installed.

If one isolator goes wears out—usually due to oil damage—the other three probably are not far behind. Because of the time involved with hoisting the engine to replace just one isolator, it usually makes economic sense to replace all of them.

MANUFACTURERS

Lord Corporation is the granddaddy of the engine isolator world, makes isolators for most general aviation piston airplanes and is the original equipment supplier for an estimated 80 percent of the new airplanes.

Barry Controls is the OEM for isolators for Beech Aircraft and makes isolators for much of the general aviation fleet. Senior Customer Service representative Greys Castanon told us that the company entered the market in the 1980s and has been progressively expanding its coverage. He echoed the comments we heard from maintenance technicians regarding heat and oil as the enemies of isolator longevity.

Initially known for isolators for the experimental aircraft market, VIP Mounts are also available for a wide variety of production airplanes, particularly aerobatic aircraft. Company representatives Robin MacDonald and Zion Dunn told us that was recently purchased by FTG, Inc., and that the company is also remanufacturing a number of various large engine mounts and doing custom solutions for antiques, classics and warbirds.

COST

Lord, Barry and VIP isolators are available through most aircraft supply houses. Prices vary widely by type of aircraft. We looked at Aircraft Spruce's website and found that there were a few airplanes where all three companies made isolators. For a Cessna 177B Cardinal, a VIP isolator was priced at $88.75, the Barry unit was $125.90 and the Lord was $157.85.

Depending on the type of aircraft, we saw isolator prices as high as $800.

After researching this article, we think that price is indicative of value. During our research, we noted that some isolators were advertised as "identical to Lord mounts." In our interview with Paul Furhman of Lord, he was adamant that "identical" applied only to appearance and not isolation efficiency. Where a maintenance technician would make a recommendation, it was for the Lord product, however, none we spoke with had anything negative to say about Barry or VIP.

It's our opinion that all three manufacturers make satisfactory engine isolators, but if you want the smoothest operation, we give the nod to Lord mounts.

Transitions For Pilots: Cabin, Headset Friendly

The latest aviator sunglasses from Flying Eyes include bifocal, gradient and photochromic lens options. We wish for more styling options.

by Larry Anglisano

CHECKLIST

- ✚ XTRActive photochromic lenses work well with cockpit displays.
- ✚ Interchangeable bifocal lenses add sizable utility in and outside of the cockpit.
- ⛔ We think styling is important. How about some more designs to choose from?

I thought the original Flying Eyes Hawk pilot sunglasses, designed with headset-friendly webbed temples, had enough utility to justify the $170 price, but for many flights they were off my head more than they were on. That's because I found the lenses to be too dark, even in partly cloudy conditions.

I just happened to be looking for prescription sunglasses that can serve flying missions, plus a variety of high-impact adventure sports. Ready to pull the trigger on a new pair of WileyX glasses, I instead invested in the latest Flying Eyes with transitions lenses to see if they could handle my abuse and how they perform in the cockpit. Here's a field report.

PHOTOCHROMICS

The second generation Flying Eyes can be fitted with a variety of lenses. This includes gradient tint and non-prescription bifocal, plus traditional solid tint and even polarized lenses, which generally don't work well with certain avionics displays. The glasses come with shatter-resistant polycarbonate lenses with a scratch- and smudge-resistant Claris HD coating.

Flying Eyes works with the ABB Optical Group digital eye lab and provides the glasses with your prescription, so you won't have to send them out for modification yourself. You will need to have your optician measure pupillary distance and fitting height. That required a second visit to my optician—and a fee of $50—since these specifications weren't written on my prescription.

My glasses arrived one week after submitting the order, and they included my prescription (I'm near-sighted) with the Transitions Optical photochromic lens option. Flying Eyes says the Transitions XTRActive is the only photochromic technology that will work effectively in cabin lighting. I agree. My previous light-adaptive lenses never lightened enough in a dark cabin, but the Flying Eyes turned completely clear in a dark cabin and worked extremely well with color panel displays. I wore them while installing the cabin cover on the dark ramp and when driving home.

VERSATILE

The Flying Eyes have Resilamide frames made from advanced poly-

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The XTRActive lenses provide just enough tint for overcast and dusk conditions, lower right, and lighten completely to easily read displays in a totally dark cabin, upper right.

Piper Comanche

The Piper PA-24-series Comanche still earns high marks for speed, efficiency and aftermarket support.

First hitting the market in 1958, the Piper PA-24 Comanche was a radical departure for Piper. Until then, the company had built mostly rag-and-tube taildraggers. Instead, the Comanche was a thoroughly modern design focused on speed and good looks, and targeting the high-performance piston-single market being tapped by the Beech Bonanza and Cessna 210, among others.

Piper's sleek, roomy all-metal design featured an oval-section fuselage, tapered laminar-flow wing and sharp-edged styling. The looks still turn heads today.

A South African company is even building an all-composite lookalike for the kit-built crowd, the Ravin. More important for the discriminating used aircraft buyer, the Comanche lends itself to upgrading, and owners who bring the airplane up to the state-of-the-art tend to hang onto them forever. There's no shortage of mods that step the aircraft up in speed and looks.

MODEL HISTORY

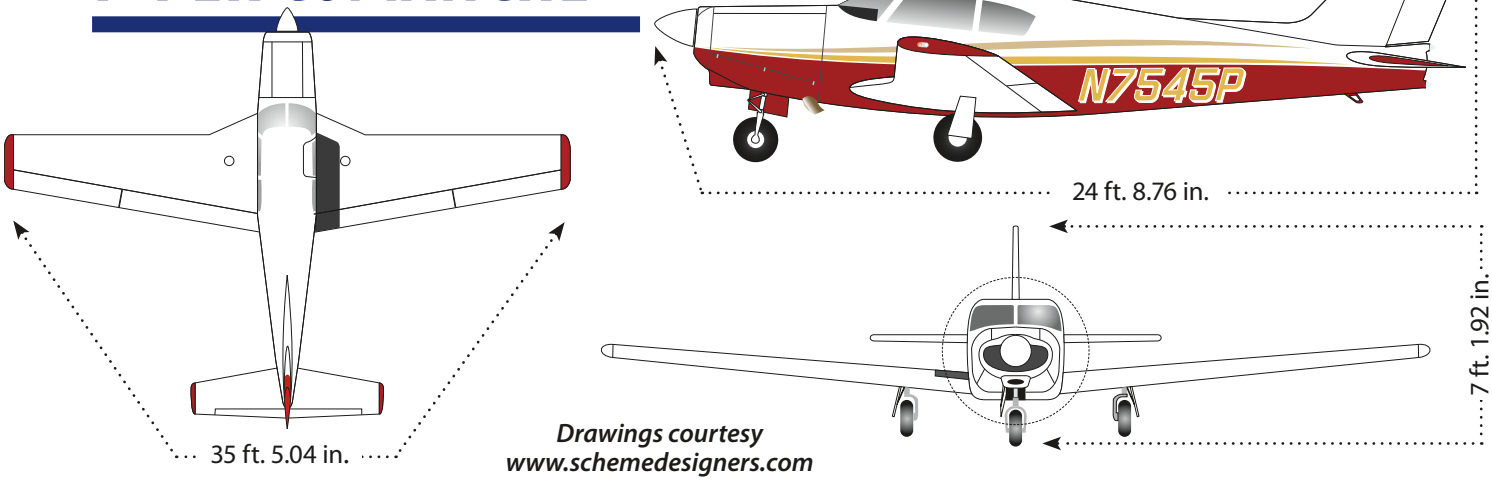
In its first production year, two models were offered: the 180-HP PA-24-180 Comanche and a 250-HP version, the PA-24-250. The 180 had a carbureted Lycoming O-360, while the 250 sported a carbureted Lycoming O-540; each turned a constant-speed prop. Flaps were manual and the gear was (and still is) a simple electromechanical design. The airframes essentially were the same—it's possible to upgrade the 180 to the larger engine—although the 250 boasted a significantly higher gross weight: 2800 pounds versus 2550 pounds for the 180. Piper didn't distinguish between the 180 and 250 in its serial number records, but total production for 1958 was 336, comparing favorably to the 396 J35 Bonanzas Beech cranked out that year.

There are so many mods available for the Comanche line that probably no two aircraft are alike today.

The basic airframe proved successful and wasn't changed much during its production run. Still, there were some notable improvements over

That's an aerial photo of Rick Mascari's Comanche 400, main photo, shot by James Lawrence. Mascari reports 200-knot cruise speeds at 9000 feet.

PIPER COMANCHE

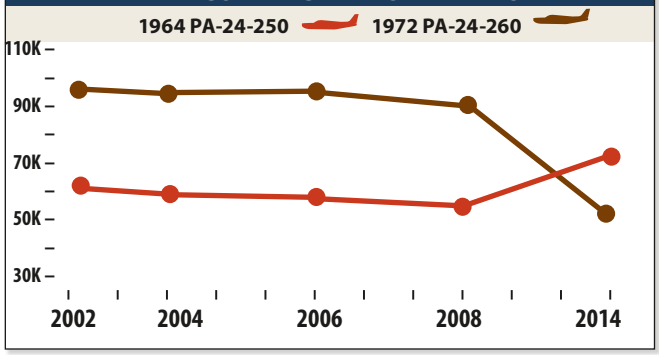


Drawings courtesy www.schemedesigners.com

PIPER COMANCHE MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1958 PA-24-180 COMANCHE 180	LYCOMING O-360-A1A	2000	$23,000	60	1020 LBS	139 KTS	±$28,000
1958 PA-24-250 COMANCHE 250	LYCOMING O-540-A1A5	2000	$28,000	60	1110 LBS	157 KTS	±$37,000
1964 PA-24-180 COMANCHE 180	LYCOMING O-360-A1A	2000	$23,000	60	1020 LBS	139 KTS	±$34,000
1964 PA-24-250 COMANCHE 250	LYCOMING O-540-A1A5	2000	$28,000	60	1110 LBS	157 KTS	±$48,000
1965 PA-24-260 COMANCHE 260	LYCOMING O-540-E4A5	2000	$30,000	60	1172 LBS	158 KTS	±$55,000
1965 PA-24-400 COMANCHE 400	LYCOMING IO-720-A1A	1800	$65,000	100	1490 LBS	185 KTS	±$100,000
1966 PA-24-260 COMANCHE 260B	LYCOMING IO-540-D4A5	2000	$35,000	60	1372 LBS	158 KTS	±$57,000
1972 PA-24-260 COMANCHE 260C	LYCOMING IO-540-N1A5	2000	$35,000	60	1427 LBS	161 KTS	±$73,000
1972 PA-24-260 TURBO COMANCHE C	LYCOMING IO-540-N1A5	2000	$40,000	60	1427 LBS	161+ KTS	±$79,000

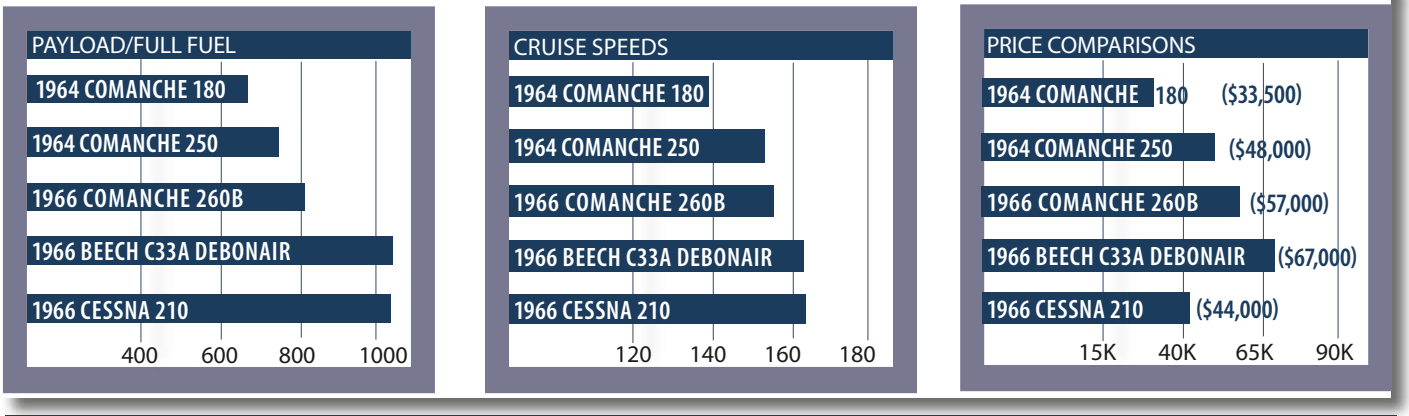
PIPER COMANCHE RESALE VALUE



SELECT RECENT ADs

AD 2002-09-08	INSPECT/REPLACE/REWORK HARTZELL Y-SHANK PROPELLER BLADES
AD 2006-20-09	REPLACE ENGINE CRANKSHAFT AT OVERHAUL OR AFTER 12 YEARS
AD 2007-04-19	REPLACE CERTAIN SUPERIOR AIR PARTS CYLINDER ASSEMBLIES
AD 2008-14-07	INSPECT/REPLACE CERTAIN EXTERNALLY MOUNTED FUEL INJECTOR LINES

SELECT MODEL COMPARISONS



Mark Zeiler's 1962 Comanche 250, left, won best in type at AirVenture 2014 at Oshkosh and best contemporary restoration at Sun 'n Fun 2014. The avionics upgrade includes an Aspen PFD, Garmin 696 mounted in a panel dock and an angle-of-attack system.

were equipped with hand brakes. But after 1960, most Comanches were delivered with optional toe brakes.

The original airplane had a 60-gallon fuel system. In 1961, Piper offered an optional 90-gallon system, which gave the Comanche 180 seriously long legs: nine hours, provided the load consisted of only the pilot, one passenger and a little luggage. Range remains one of the Comanche's strong points and many have been fitted with even more fuel capacity in tip tanks and fuselage tanks to give it impressive endurance. In 1961, the gross weight of the 250 was boosted by 100 pounds. Electric flaps replaced the manual ones in 1962 models.

Production of both the 180 and 250 ended after the 1964 model year. The 180, which obviously came second to its bigger brother in load carrying and was not selling as well as the 250, was dropped altogether while the 250 was upgraded to the 260.

EVOLUTION

The 1965 Comanches are transition airplanes in that they have the earlier fuselage mated to the later 260-HP engine, albeit with a carburetor. The big engine gives these airplanes excellent climb performance, as much as 1500 FPM. In 1966, the Comanche B, with a fuel-injected 260-HP Lycoming IO-540-D4A5, a boosted gross weight (now 3100 pounds) and two more seats were added to the lineup, starting with serial number 24-4300. These and later Comanches can be spotted by the extra cabin window and rear baggage door on the left side, which doubles as an emergency exit. The airframe dimensions are identical, but the internal fuselage structure was changed to accommodate the additional window. The added seats are in the baggage compartment.

The Comanche C was rolled out in 1969, with further refinements, including another gross weight increase and a distinctive "shark nose" cowl starting with serial number 24-4804. The 100-pound rise in gross gave the airplane a hefty 1427-pound useful load. The airplane also gained cowl flaps and an aileron-rudder interconnect. By the time these models were introduced, the Comanche's production run was about to end without warning, so this variant is comparatively rare.

TURBO AND 400 HP

A turbonormalized version of the Comanche C was offered alongside the normally aspirated model in 1970. Dual turbochargers allow operation at altitudes up to 25,000 feet. The Rajay system essentially had a "second throttle" wastegate control the pilot used to manually set boost at altitude. Piper did the turbo 260 installation properly by providing check valves and a turbo oil sump. Upon shutdown, this allows the oil to drain from the hot turbos instead of remaining inside them and cooking.

A side benefit of the standard turbo installation is that it's quieter than the normally aspirated Comanche C. The -N1A5 engine, beefed up to handle the boost pressure and higher temperatures at altitude, is just as robust as the normally aspirated engine; both have a 2000-hour TBO. Also, as with the fuel injection system, earlier airplanes can have a turbo added.

Meanwhile, the ultimate in wretched excess, or perfection, depending

on your point of view, has to go to the Comanche 400. It was introduced in 1964 and discontinued only a year and 146 airplanes later. This beast had a normally aspirated, fuel-injected, eight-cylinder Lycoming IO-720-A1A fitted with a three-blade prop. The airframe is essentially identical to the 250, except the 400 uses the Piper Aztec stabilizer.

The engine gulps huge amounts of fuel (20 to 22 GPH at 75 percent cruise, held in optional 130-gallon tanks), has a TBO of 1800 hours and costs north of 50 grand to overhaul. On the other hand, the 400 offers spectacular performance—at least for 1964 technology—with max cruise in the 185-to-195-knot range.

When compared to a Comanche B, the 400 has a gross weight 500 pounds higher. However, the empty weight is also higher, by 337 pounds. That extra payload has to go for fuel to feed the IO-720, meaning that for flights of more than 300 miles, the 400 actually has less payload available than the 260.

In 1972, there were two single-engine Comanche models still in production—the 260 and turbo 260. Their excellent build quality with total corrosion proofing before assembly and compound curve panels meant that the underlying cost structure was greater than emerging designs from either Piper or its competitors.

Then Tropical Storm Agnes drove the Susquehanna River out of its banks and wiped out Piper's Lock Haven factory. This gave Piper a reason to pull the plug on the airplane, choosing to concentrate on the more-popular, less-expensive and higher-profit PA-28 line, including the Arrow being produced at the Vero Beach site.

Several years ago, there was some thought given to resurrecting the design at the hands of the legendary Roy LoPresti, but like the SwiftFury, it came to nothing. LoPresti did create some interesting aerodynamic mods for the airplane, however.

Overhauls on the Lycoming IO-720-A1A engine in the hot-rod PA24-400, top, can set you back $60,000-plus. There are few gotchas when maintaining tamer four- and six-cylinder Comanches. Removing the lower cowling, bottom photo, reveals a familiar and reliable powerplant.

HANDLING

Myths abound about the Comanche being difficult to land smoothly because of a tendency to float during the flare, then settle sharply. Some owners dispute this, others confirm it. Comanche experts tell us the attitude window for a smooth arrival is smaller than that of many modern spam cans, but no different from some high-performance aircraft or taildraggers.

One remedy is to add the Knots2U wing root fillets, which eliminate the vortex striking the stabilator when flaps are used. The International Comanche Society (ICS) reports the best way to learn to land—and fly—this machine is to get some dual from an expert in the type, not the local flight school. Fly it like it's meant to be flown, and you'll wonder what the barroom chatter was all about.

In flight, handling is responsive and pilots report that the Comanche is a sheer delight to fly. As an instrument platform, it's stable and responsive. At busy airports, there's no problem keeping approach speeds right in the flow.

With practice and with gear down, finals for a precision approach can be flown at 130 knots and, with the gear up, even faster. The aircraft can then be slowed in the last few hundred feet to land short and turn off at the first taxiway.

There's a bit of a tendency for the Comanche to wheelbarrow during crosswind takeoffs, caused by pilots holding down the nose to prevent a premature departure. This, in turn, is due to the airplane's tail-low stance when sitting on its gear.

Some pilots pump up the main gear oleos to reduce the tendency, or install a smaller nosewheel tire to reduce the static angle of attack on takeoff.

PERFORMANCE, LOADING

The Comanche 180 has less-than-stellar speed but long legs for its class. Burning 8 to 10 GPH, it will cruise at about 140 knots. An American General Tiger with fixed gear goes just as fast and another contemporary retractable, the Mooney M20C or M20E, will outrun the 180. The 180 can climb at 700 to 900 FPM after using more than 2200 feet to clear a 50-foot obstacle. The 250 and 260 are better performers. Speeds are up around 155 to 160 knots at cruise, burning about 12 GPH. Still, these speeds trail contemporary designs of similar vintage and power, such as the P35 Bonanza.

As you would expect from aerody-

Robert Loughlin's 1959 Comanche 250, top photo, sports tip tanks. Tank mods can increase endurance to a bladder-busting nine hours.

namics 101, the extra 10 GPH the Comanche 400 burns yields only about 10 to 15 extra knots. The 400 will, however, climb like nobody's business: 1600 FPM. Not many singles can match it.

The 180's load-carrying capacity is ample but modest. With a gross weight significantly lower than later Comanches, cabin payload with full standard fuel (60 gallons) is about 660 pounds, making it a three-person airplane. The 250 can haul 750 pounds with full standard fuel, while the 260s and 400 can lift up to 1000 pounds.

The straight roofline giving the Comanche its distinctive crewcut looks also reduces visibility upwards, although it's not as bad as some airplanes and does provide welcome shade in hot climates. The cabin itself is roomy and comfortable with good width, if a bit drafty and noisy, say some owners. Legroom is good for both pilots and passengers, and the cabin is definitely more spacious than the Arrow that followed. The fifth and sixth seats, when available, are suitable only for children or the smallest of adults.

The panel is what one would expect from a circa-1960s airplane, with good space for instruments but early, unrestored models will look dated by modern standards. The early panel layout doesn't conform to the later standard "T" configuration, so it may be unfamiliar to recently trained pilots. But the panel—as with most other Comanche characteristics—often has found itself the subject of owner upgrades.

MAINTENANCE/ADS

Owners give the maintenance burden mixed reviews. The Comanche is one of the best-built metal singles available, and it can be well maintained at lower cost than aircraft of lesser performance due to the widespread use of generic parts. There's also a good supply of aftermarket and PMA'd parts for commonly needed items. While the airplane isn't intrinsically difficult to service, system age cannot be ignored: Even the newest Comanche is approaching 40 years of age.

The aircraft are relatively complex—certainly when compared to, for example, a Cessna 182—so they shouldn't be thought of as cheap to maintain. However, with care, costs will be more than manageable and once a system or component is properly repaired, it can be expected to stay that way for a while. The trick—as it is with any older aircraft—is finding a shop or technician experienced in the type. If you find the right person and keep them happy, you'll be happy.

The landing gear system certainly is not complicated but a review of service difficulty reports indicates it's a top sore spot, along with general airframe corrosion, and engine/prop issues. Those familiar with the Comanche maintain major causes of gear-system problems are poor maintenance or rigging by mechanics unfamiliar with it. Pilots who don't understand the undercarriage and its various procedures, particularly the emergency extension procedure, also are a source of problems.

The ICS can help on both counts, with a list of qualified instructors and shops familiar with the airplane. Aftermarket gear warning systems are also a good investment to supplement the system originally installed.

Recurring ADs on any aircraft can run up the cost of operation, and Comanches are no different. One on the landing gear (AD 77-13-21) mandates replacement of landing gear bungees every 500 hours or three years to prevent landing gear collapse after manual extension. There's also an AD on the vertical fin attachment (AD 75-12-06). A prop inspection (AD 2005-18-12) is the most oft-complained about, costing nearly $1000 every 500 hours or five years.

Also, a different prop AD (AD 97-18-02) can prove costly for 250/260 owners. As one result, many have opted to replace their old Hartzells for new two-or three-blade Hartzell or MacCauley propellers, which terminates the AD. Apart from the aforementioned ADs, Comanches are unremarkable; most other ADs are minor and/or shotgun directives that apply to many airplanes.

MODS, CLUBS

There are so many mods available for the Comanche line that probably no two aircraft are alike today. You can modify its engine, its look, its handling, its panel and its features. Check a copy of the Comanche Flyer magazine or the ICS Web site (www.comancheflyer.com) for details. For instance, it's possible to retrofit the Lycoming O-540 engine into a Comanche 180 of 1960 or later vintage; there's at least one published report of this being done on a Form 337, although we don't know of any shops offering the mod. Aside from the engine and prop, it involves the engine mounts, some baffling, controls and the exhaust system. The result is essentially a Comanche 250 with a low gross weight. Also, the carbureted O-540 found in the Comanche 250 may be upgraded to fuel injection.

LoPresti Speed Merchants (www.speedmods.com) offers, among other

mods, the "Wholey Cowl" originally dreamed up for the Comanche's resurrection, along with a three-blade "SynchroPulse" prop. Both are available for the 250 (which requires some additional mods) or the 260. Cowlings are also offered by Aviation Performance Products (www.aviationperformanceproducts.com), which claims that its Eagle XP cowling increases speed, economy and improves maintenance access. The company also offers a stainless steel dual exhaust system. These mods are available for all Comanches except the 400.

Knots2U (www.knots2u.com) also offers aerodynamic mods including a wing fillet helping out the airplane's landing characteristics, a dorsal fin kit, speed brakes and much more. Meanwhile, Met-Co-Aire (www.metcoaire.com).

Other popular modifications include new gear wiring harnesses from Comanche Gear (www.comanchegear.com), one-piece windshields from Webco (www.webcoaircraft.com) and so on. These mods generally are applicable to all Comanches.

For a time recently, renowned attorney F. Lee Bailey—who souped up the PA-30 Twin Comanche into the Bailey Bullet—even contemplated remanufacturing single-engine Comanches. The result, in his words, using modern avionics, instrumentation, soundproofing and environmental systems, would have been a "better than new" Comanche costing less than a brand-new, comparable single.

Alas, wiser heads—along with, perhaps, a healthy respect for general aviation's economy—sidelined the project.

The point is the Comache's list of mods, modifiers and parts resources is long and best accessed from involvement with the ICS and its members and publications. Speaking of ICS, owners tell us the group is an exceptionally good resource for Comanche owners. It offers a magazine as well as other resources and can be reached at 405-491-0321 or via the website at www.comancheflyer.com. The ICS also offers a technical support service when you and your mechanic need someone to talk to.

OWNER FEEDBACK

I was 63 years old when I got my pilot license. I am now 73. My first and only aircraft has been my Comanche 250, which spent most of its life in Texas. The first owner—an elderly 84-year-old pilot—had tears in his eyes as the plane left his sight.

It had been completely updated with fresh paint, leather interior and speed mods. According to my instructor at the time, it had a nice set of instruments. Of course, I did not know how to fly when I purchased the Comanche, so I didn't knew what the instruments were for, but I was soon to learn.

I have since flown the Comanche 800 hours, flew to AirVenture at Oshkosh, Wisconsin, several times, flew around the United States and even flew along the New York Hudson River corridor and around the Statue of Liberty. I thought I was dreaming.

I brought this Comanche into the age of modern avionics, upgrading from Garmin GNS530 and GNS430 navigators to Garmin GTN750 and GTN 650 touchscreen units, in addition to a Stormscope, satellite weather, S-TEC 60 autopilot with GPS steering, HSI and a J.P. Instruments color engine monitor with fuel computer.

The throttle quadrant has been upgraded to vernier controls and the cabin windows were replaced with thicker, tinted glass. I also added airbag shoulder harnesses.

With a 90-gallon fuel capacity and 13-15 gallon-per-hour fuel burn, it's an efficient 155-knot airplane. The long 38-foot wingspan gives it a great platform for flying and positive control at all levels. The cabin space is more than a Beech A36 Bonanza and sitting up high gives a great forward view during flight. The Lycoming 540 aspirated engine is bulletproof, according to fellow flyers.

Because of its classic vintage, the Comanche is easy to understand mechanically. You will find that many aviation mechanics are well-versed in working on the airframe, plus it is well supported by ICS members. Parts, for the most part, are readily available by Piper vendors and Comanche aftermarket specialists.

As for mission capability, we recently flew from Fond du Lac, Minnesota, to Muskogee, Oklahoma, in 3.5 hours. At 8500 feet we saw speeds of 178 knots burning 13.5 GPH at 60 percent power. As seniors, my wife and I enjoy these kinds of flights in the Comanche and certainly don't miss the hassles of airline terminals and TSA security checks.

The Comanche Society and our Comanche owner friends have made our social life from medicine come alive. We had numerous fly-ins and some experiences would never have happened if it wasn't for our Comanche. It's a great aircraft and lots of fun. We call it our magic carpet ride.

Dr. Robert Fox
Muskogee, Oklahoma

I just thought I'd write to let you know how much I like my Comanche 400, N64400. The Comanche has a laminar flow wing with flush rivets that make the airplane really slippery. It started out with an efficient, 180-horsepower powerplant that gave the first Comanches respectable speeds. In fact, the Comanche was the fastest production airplane manufactured with a 180-horsepower engine. But Howard Piper had other plans. Patterned after the P-51 Mustang, Mr. Piper installed a 400-HP engine into his slick Comanche. The results are impressive.

Here's an airplane that has a lot of flexibility. For example, with 400 HP under the cowling, it can climb at over 1600 FPM at its gross weight of 3600 pounds. It will cruise at 16,000 feet at over 170 knots true airspeed and burn about 14 GPH. Or, you can stay at 9000 feet, burn roughly 21 GPH and cruise at 200 knots true airspeed. The 400 Comanche carries 130 gallons of fuel (124 usable) so, at altitude, easy math proves the airplane has long legs. I've flown from Las Vegas, Nevada, to Eastern Iowa at 17,000 feet, nonstop several times and still had over an hour of fuel remaining. Pull the throttle back to 50 percent power (200 horsepower) and you'll reduce the fuel burn to just 16 GPH and still see 165 knots true airspeed.

The eight-cylinder engine runs extremely smoothly. Those extra two pulses really make a difference because a smooth engine is a happy engine.

My Comanche 400 is pretty well equipped, which brings its empty weight to 2080 pounds. With full fuel (800 pounds), that still leaves over 700 pounds of useful load.

It's a great airplane mated to a

COMANCHE CRUNCHES: MAINTENANCE

Our review of the 100 most recent Piper Comanche accidents uncovered something we expected in an aging fleet—a substantial number of accidents due to failure to perform needed maintenance or maintenance that was poorly performed. It showed up in engine failures, 12 gear collapses and an inflight breakup where a badly repaired stabilator came apart.

Particularly impressive was the maintenance malpractice on one Comanche: following replacement of the mixture control cable, the pilot found that the nose gear would not completely extend. Using considerable force on the manual gear extension system, he had it almost down and locked when the engine quit. The cable was so badly routed it was preventing the nose gear from extending, and the pilot's action caused the nosewheel to pull the cable to pull the mixture to idle cutoff.

Two pilots found out that when you can't get the gear extended on a Comanche, land on pavement, not grass. Sliding on the turf caused it to ball up and do damage to structural members of the fuselage.

We were pleasantly surprised by the low number of runway loss of control (RLOC) accidents, eight. We usually see more than 20 for a nosewheel airplane. We think the combination of the wide main landing gear and higher time pilots flying the airplane helped keep the number low. We did note that the "other" category included at least three overshot landings where the pilot flew final too fast and a couple where the pilots got too slow and stalled or just touched down short of the runway.

Even though we think Comanche pilots tend to be higher time than pilots flying fixed-gear airplanes, there were two student pilots who demonstrated impressive levels of bad judgment. One decided to make a night flight at over 18,000 feet, without oxygen, after taking a combination of meds and alcohol. The airplane hit in a flat spin. The other also tried a night flight and got the airplane into a diving spiral before it broke up.

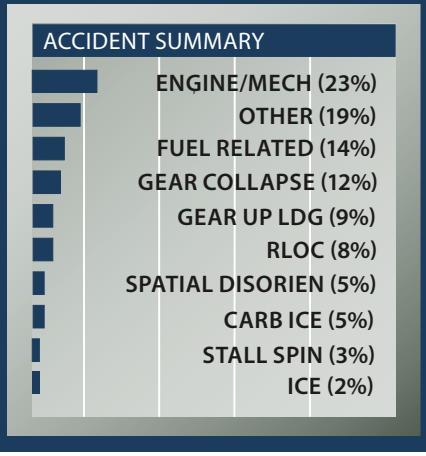
Icing lead to the inflight breakup of a plane flown by a pilot who friends said didn't like to talk with ATC. In his final trip aloft, he flew in clouds, collecting ice, for some time. He didn't bother to file IFR or speak with anyone. Reconstruction of the radar track indicates he stalled the airplane, lost altitude, then recovered into a dive that he could not control and the airplane broke up.

Icing also caused damage to three Comanches—the pilots were handling the buildup just fine by flying fast on the approach. However, when they began to flare to land they pulled the power to idle. The airplanes stalled and hit so hard that there was structural damage. Lesson: with ice, keep the power on until the wheels are rolling.

Carb ice brought down a surprising five Comanches—Lycomings will develop carburetor ice.

Too fast on landing is not good in a Comanche: one pilot came in at the speed of heat, tried to force the airplane on three times, each time hitting the prop. After touching down the fourth time, he ran off the runway and hit obstructions.

Nine pilots forgot the gear and slid to a stop. The 10th did a touch and go after hitting the prop tips. He then pitched up 45 degrees, stalled and crashed.



great engine—the perfect combination that only a visionary like Howard Piper could have developed.

Rick Mascari
via email

I am the second owner of a 1966 B-model Comanche that I purchased in 1985 and have 4000 hours in the airplane. The Comanche 260 is fun to fly, fast, responsive and stable for IFR. It lands safely and usually smoothly, with the correct speed and an exaggerated flare. Strong crosswinds and short field landings are straightforward.

Useful load, long range and weight and balance capabilities are great, in my view. The strong airframe has taken me through extreme turbulence, heavy rain and unintentional icing that accumulated nearly 0.5 inches on the airframe. The onboard XM Weather system has eliminated dangerous weather mistakes that were common decades ago.

This Comanche has most of the available speed kits. It has many faring and gap seals, a VNE increase, Lopresti engine cowl, plus a three-blade propeller.

Generally, I see cruise speeds of 165 kts burning 13 GPH lean of peak, or over 170 knots at 15 GPH rich of peak. Given the value of the airframe, all these aftermarket mods don't make much sense, but when you own a plane for 30 years, these things happen. Unmodified Comanches fly the same, just a little slower. Like other airplanes of this era, the interior is loud and drafty. The interior trim, instrument panel, seats and doors fit poorly.

I own another more modern pressurized airplane, but for fun, the Comanche is my first choice. For the purchase price of a Cessna 172 you get a complex, high-performance transcontinental airplane.

The landing gear and stabilator are unique to Comanches, and a knowledgeable mechanic is required. With a Comanche expert doing the maintenance, these systems have been trouble-free for me, but not cheap. Other systems and accessories on the aircraft are common to many other airplanes. Parts are primarily through boutique suppliers and rarely a problem to source. The engine is reliable, smooth, easy to

start and well supported. The engine should make TBO with perhaps only a cylinder or two replaced along the way.

Expensive recurring items are the gear AD at every 1000 hours and the tail AD (who knows the interval?), plus fuel bladder service every 10 years. You'll want to budget $2000 for each of the recurring groups. Base annual inspections should run approximately $3000.

Insurance is $1450 yearly for the $85,000 hull value on my airplane. I figure it costs around $125 hourly to fly, which includes fuel, oil, insurance, maintenance, ADs, engine reserves, avionics repairs (not upgrades) and hangar, amortized over 150 flight hours per year.

Bill Ritter
Odessa, Texas

I have over 30 years experience owning, flying, maintaining and modifying aircraft, including Piper Comanches. The old boys that I learned to fly with would say that if you can shut the door on whatever you got into a Comanche, it would fly away without a problem. I would prove that time and again in my Comanche 250.

In flight, the Comanche is smooth, stable and tight, with a climb rate that is impressive and difficult to prevent. As for range, even an old 250 model with 60 gallons of fuel will generally go from Western Massachusetts to North Carolina in 3.5 hours with one hour of fuel remaining. If you want to coax Comanche 260 speeds from a 250 model, try using the 260's power settings. The engines are identical, but with a different propeller redline.

The AD list is pretty long, but most of the items are one-time fixes, followed by future inspection. I've found that many aircraft are compliant. The number of available aftermarket mods for the plane is extensive; some are overpriced and pointless in my view, while others are fairly cheap and offer great results. Products from Knots2U and Webco are respected.

The mods that can offer the most speed include relocating the brakes to the inside of the gear forks, gap seals, wheel well slippers and wingroot fairings, both front and rear. Since it's important that the flight controls are properly rigged (while assuring the landing gear and landing gear doors are retracted fully and fit flush.) This should be the first step before any aftermarket mods are installed. I've found that landing gear bungees generally need replacement at every annual inspection.

After years of distance-traveling in my airplane (to places I never would have visited if it weren't for my Comanche), I believe a full-featured autopilot is perhaps the most useful avionics system you can buy.

The Comanche market has two price points, really. Consider that you can buy a cream puff in the $125,000 to $150,000 range, and an airplane that needs serious work for $19,000. Either way, a realistic budget should be around $100,000. If you wanted to start out with a cheaper airframe, buy a 180-HP model and do a 260-HP conversion with fuel injection. In my opinion, there is no reason to own a 180 Comanche unless you are consumed with fuel range and can tolerate the vibration from the engine being so far out from the firewall. Converting the engine from four cylinders to six can be signed off with a logbook entry.

Before buying, examine the logs for entries that indicate the airframe has a history of good landing gear system maintenance and repair. With the plane on jacks, swing the gear and look for loose fits and bushings.

All of the fuel bladders should be replaced with new ones. If not, the selling price should be adjusted to reflect a cost of $1500 per bladder.

While Comanche engines are generally dependable, beware of top-end overhauls that were accomplished without replacing the cylinders with new ones. While many Comanches sport three-blade propellers, some could have old clamp-style propellers. A prop can cost $15,000-plus.

Cabin and cowling door repairs are often neglected, so be sure to inspect them for shoddy repairs and improper cabin door seals. A competent tech can generally rig a cabin door in an afternoon.

Even heeding all of my advice, expect to spend money to acquire and keep an aging Comanche.

Don Gagnon
Montague, Massachusetts

The Aviation Consumer

Flying Eyes

(continued from page 23)

mers, lending to flexibility, durability and lighter weight than many other frames. The only nit I have is the lack of available styling options.

The Hawk frames come with two sets of removable temples, in addition to the webbed head strap. The standard temples are 5 millimeters thick, while the micro-thin temples are 1 millimeter thick. Both varieties have enough flex to not put uncomfortable tension on the side of the head. In fact, I found the micro-thin temples comfortable enough to not even use the webbed strap. Plus I liked the ability to take the glasses off and put them back on without removing the headset. I wore a Lightspeed Sierra and AKG AV100.

The overall design has also been improved, making it easier to quickly remove and swap the temples. Simply squeeze the buttons, release the temples from the frames and snap the new temples in. The headstrap is removed and installed the same way. A lightweight cinch holds the headstrap in place, while keeping any excess on the back of the head. I wear a short haircut and the strap never tugged at the hair, although it did make me itchy.

Non-prescription Hawks start at $169, nonprescription bifocals are $189. Prescription options start at $336. If you an own an original Hawk model, basic prescription lenses can be fitted in them for $351, including shipping both ways.

Visit www.flyingeyes.biz, 888-568-8978.

SiriusXM/WSI

(continued from page 19)

the upper left corner of the app. This is for graphically mapping (in purple color-coding) projected turbulence as high as FL390.

WHICH MARKET?

As good as we think the portable SXAR-1 receiver performs, we're not convinced it's a game-changer in a market that's seeing an upswing in major installations, including ADS-B In receivers. The Broadcast advantage, however, is more weather products and functionality on the ground. That can't be said for ADS-B.

It's tough to say which market the new SXAR-1 receiver will appeal to. It could be buyers that want to ditch existing Garmin portables, like older GPSMAP396/496 systems, in favor of using the iPad exclusively. For these users, the future of their existing data plans (and receivers) is unknown. Frankly, we can't see SiriusXM maintaining both data streams, and we suspect many users will be forced to upgrade.

Adding to the competition is Garmin's recently introduced Connext wireless cockpit interface and Flight Stream wireless transceivers. For users that want to display XM data from an existing Garmin GDL69 receiver on their iPad or Android devices, the Flight Stream will do it. But that requires an installation. For that reason, we can see the appeal of the SXAR-1's toss-on-the-panel portability. Based on our trials we can call it a solid performer, but think it needs more popular app interfaces to gain sizable market traction. SiriusXM told us other app interfaces will be available in the future, but wouldn't say which ones.

As for the WSI Pilotbrief for iPad app, we think its weather display capabilities are unmatched, but we think users will demand more navigation features. This includes georeferenced charts, frequencies and airspace data, to name a few.

While we like that it can interface with the Dual XGPS170 ADS-B receiver, it won't display ADS-B traffic. That's a huge limitation, in our view.

You can purchase the SXAR-1 receiver through Sporty's, and SiriusXM is offering a $300 rebate when you sign up for a six-month or longer aviation subscription. Basic WSI Pilotbrief subscriptions start at $29.99 for a three-month period.

FEEDBACK WANTED

AVIAT HUSKY

For the April 2015 issue of *Aviation Consumer*, our Used Aircraft Guide will be on the Aviat Husky, the rugged backwoods taildragger. We want to know what it's like to own these planes, 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) you'd like to share to the email below. We welcome information on mods, support organizations or any other comments. Please send correspondence on the Aviat Husky by February 1, 2015, to:

Aviation Consumer
e-mail at:
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