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FIRST WORD**THE END OF THE ROAD FOR HIGH-PRICED AVIONICS**

That's my prediction for the coming years and we can all thank the FAA. That's because the agency has a welcomed shift in mentality when it comes to certifying avionics, which of course has a direct effect on pricing. The reality check is that avionics technology has changed since the bad old days of analog equipment, and the long drawn out TSO pathway to certification is finally coming to an end. Prediction number two: Manufacturers who continue to certify products via the old-school TSO will be at a serious price disadvantage in the marketplace. Buyers will surely vote with their wallets.

The smart leadership at Aspen Avionics understands this fully and has already started to change the way it certifies some of its products. As we go to press, the company announced the Evolution 5 primary flight display pictured here. The E5 hardware might look identical to the Evolution display the company has been selling for years (it does have a brighter display and faster processing power), but the instrument is really the poster child for the next generation of certified avionics. That's because it's approved for retrofit in a wide range of aircraft (over 650 models), approved for use as the primary flight instrumentation without the need for backups (yes, yank all the spinning gyros from the panel and the vacuum pump from the engine), plus it's compatible with a wide variety of third-party avionics. The price? Under \$5000. The reason Aspen is able to sell its new E5 at a price point that I think buyers will embrace is because the instrument has no TSO. Instead, Aspen has done what Dynon and Garmin have done with competing EFIS displays and earned an STC for installation, sidestepping the expensive TSO process. Non-TSO'd flight instruments were once unheard of for certified aircraft, but the FAA recognizes that the technology packed into modern EFIS displays is simply more reliable and more safety-enhancing than steam gauges. Forget the romantic notion that real pilots fly steam gauges—we're so beyond that. I asked Aspen's president and CEO, John Uczekaj, to backstop my thinking on all this.

"I believe the FAA leadership has looked at the data, looked at the way we fly, looked at the technology in the UAV market and has come to the realization that safety can be improved by the current new technology," he told me. I played devil's advocate and asked Uczekaj if proving a product's reliability via the STC process is really as effective as going through the rigors of the TSO process. That's not an easy one to answer because a TSO is a prescriptive process. Still, the TSO process in terms of hardware testing differs little from an STC process because you still have to prove the hardware can function in a variety of temperature/environmental conditions. It's the software aspect of new avionics that has changed the means by which new equipment is certified. "I can now prove a product based on performance rather than by prescriptive means, eliminating the idea that the more paperwork I generate, the more reliable a product is," Uczekaj said.

My third prediction: Buyers will expect an open architecture, or the ability for a given brand to play well with others. Aspen gets it. Like the original Evolution display, the new E5 has a liberal interface potential and can be upgraded for more features with a software load. Moreover, a huge selling point of the E5 is its ability to interface with TruTrak's low-cost Vizion autopilot. It can't play with Garmin's low-cost GFC500 autopilot—Garmin's STC doesn't include third-party displays. But, Garmin is credited for opening its G5 electronic DG/HSI to third-party autopilot interfaces, including S-TEC, Century, Cessna and Honeywell.

I think the FAA's new mentality will play a huge role in reducing the price of avionics as we're beginning to see, but it's up to manufacturers to be innovative where it counts. This doesn't just mean adding new features and capabilities. It also means giving buyers what they'll expect: better value through an open architecture that plays across brands, just like Aspen's new E5. —Larry Anglisano



THREE-BLADE PROPELLERS

After reading about three-blade prop upgrades in the April 2018 *Aviation Consumer*, I thought I would share my upgrade experience. After converting my elliptical prop tips to square tips by touching a runway at speed, I decided to change to a three-blade prop for my Mooney 231—but not for the looks—but to have less noise and vibration without a performance penalty.



The change was from the standard two-blade McCauley to a three-blade McCauley Black Magic. While I considered an MT composite and also a Hartzell, I saw no compelling reason to buy them. The three-blade prop was perfectly balanced upon installation and had markedly less vibration. Interior screws no longer work their way out of the overhead panels, plus the three-blade prop is markedly quieter. I used to wear ear plugs in both ears under my noise-cancelling headset. It's not as quiet as my glider, but at least now I don't need the earplugs.

The climb performance with three blades is markedly improved by about 30 percent and the performance ceiling is also improved. I don't yet know just how much because at FL220 we were still climbing at 500 FPM, but my oxygen was inadequate to go higher. With the two-blade prop, climb petered out about FL210 and the engine would get hot.

I've found that the cruise performance is about the same as the two-blade propeller. The McCauley tech rep said, "You can expect the performance to be about one to two knots slower than published book speeds below 7000 feet, and one to two knots faster above 12,000 feet." I do not have precise instrumentation to confirm, but it is definitely not slower.

These results may be slightly affected by replacing one mag with an EIS electronic ignition, which has been wonderful for smooth operation

and cooler EGTs, plus it is likely the main reason for the improved service ceiling.

Daniel L. Johnson
Menomonie, Wisconsin

As you note, two variables changed at once: the propeller upgrade and the ignition upgrade. The performance boost you report could well be the result of the electronic ignition. We cover this topic extensively starting on page four of this issue.

NO TURBINE KOOL-AID HERE

I wonder if you guys were drinking the marketing Kool-Aid when you wrote the used single-engine turbo-prop comparison article in the March 2018 *Aviation Consumer*. In it you wrote: "The most recent 850-HP TBM 930 will smoke along at 328 knots at FL260, with VFR range over 1200 NM." How did that sentence get past your editors? Pass it around and see if they can spot the mistake. Hint: You can't fly VFR at FL260.

You publish the NBAA IFR range for the Pilatus PC-12, so why not for the TBM, too? NBAA IFR range is the standard that should be used for any pressurized aircraft.

Jim Covington
via email

While an aircraft flying at FL260 must be on an instrument clearance, the fuel it's required to carry for the flight is based on FAR 91.151 and 91.167. For a day flight in which the destination meets the requirements of 91.167, the flight need only comply with the 30-minute VFR fuel requirements even though it is on an IFR flight plan and clearance. NBAA range is often used in making aircraft comparisons, yet it's interesting to see what the range is when the destination is VFR and meets 91.167, so an alternate airport is not required—as is the case for what we understand to be the majority of flights on instrument flight plans.

We've also noted in our reviews of pressurized aircraft that the actual fuel consumption, speed and range are almost

invariably as good as (or slightly better than) the numbers published by the manufacturers. In a review of one of the TBM series the actual cruise performance beat the book numbers.

We're well aware of the constant battle between marketing and engineering over performance data, and that sometimes marketing wins. It's why we do our best to publish real performance numbers when we do aircraft reviews.

LSA SEAPLANE RATINGS

I'm sorry to be so dimwitted. I'm sure Paul Bertorelli explained it well enough in his LSA float training article in the April 2018 *Aviation Consumer* for everyone else to understand, but not me.

I have a private pilot certificate with a single-engine land rating. If I take instruction in a Searey LSA and opt for the formal FAA single-engine sea rating, am I then qualified to fly a Piper Cub or a Cessna 172 on floats, to name two examples?

Mike Koerner
Palos Verdes, California

Yes. While the training is essentially the same for a sport pilot seaplane add-on as it is for SES privileges, you'll do the checkride for a SES rating with a designated pilot examiner. You'll ride with an instructor and write a smaller check for the sport pilot seaplane endorsement.

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Electroair's Electronic Ignition: Performance

Developed from the auto racing world, Electroair's high-energy, variable-timed ignition system measurably improves performance and efficiency.

by Rick Durden

Magnetos have been around so long that one can't help but wonder if Benjamin Franklin went directly from his supposed kite-into-a-thunderstorm electricity experiment to his basement where he built the first one.

While reliable, continuing to use mags on piston aircraft engines isn't terribly efficient. They always fire

the spark plugs at the same point—usually 25 degrees before top dead center (TDC)—and rely on the combustion event ignited to carry on by itself to reach maximum pressure by the time the piston reaches 11 to 17 degrees past TDC. Mags put out a spark that is on the order of 12,000 volts. That's good, but not great. Finally, magnetos wear out

faster than many other components in the airplane and need to be pulled for inspection and repair or replacement every 500 hours, not a trivial expense.

Automotive technology long ago gave us electronic ignitions that advance or retard the spark (adjust the position relative to TDC at which the plugs are fired) to greatly increase the power and efficiency of the combustion event and lengthen the time the plug fires—creating a hotter, longer-lasting ignition source that increases power output as well as making starting easier and reducing plug fouling. Finally, electronic ignition provides some five times the voltage to the plugs—70,000 volts—creating the hotter spark.

VARIABLE TIMING

We've had variable engine timing in aviation since spark advance was first used prior to World War I—it's a major reason why some WWI airplanes could get to 20,000 feet. The advent of the microprocessor meant that engine timing could be precisely controlled and set for maximum power and efficiency in the conditions in which the engine was flying. It is especially valuable at higher altitudes and in turbocharged airplanes.

What we consider to be the leader in the field of electronic ignition for piston-engine airplanes is Electroair (www.electroair.net), based in Howell, Michigan. It originally developed its electronic ignition system (EIS) for homebuilt aircraft.

In 2011 Electroair received its first



Plug wires encompass the components of Electroair's electronic ignition system for four-cylinder engines, above: clockwise from upper left, controller, mag timing housing, coil pack and manifold pressure sensor. The remaining wires tie the system together. Components of the six-cylinder EIS, below, clockwise from upper left: controller with system wires around it, mag timing housing, wiring harness, coil pack and manifold pressure sensor.

Six-cylinder EIS with coil pack on the firewall and one magneto replaced with the mag timing housing for the EIS.

STC for installation of its EIS on certificated airplanes with four-cylinder Lycoming engines. Electroair now has STCs for over 400 different aircraft models—singles and twins—and the number is increasing.

ELECTROAIR'S SYSTEM

Electroair's EIS is a high-energy, tuned electronic ignition system developed from a high-performance automotive system designed for racing. Installed, it replaces one of the aircraft's magnetos. Not only does the system alter the timing of the onset of plug firing and provide a much higher-power spark, it provides a longer spark event that results in burning the fuel more completely.

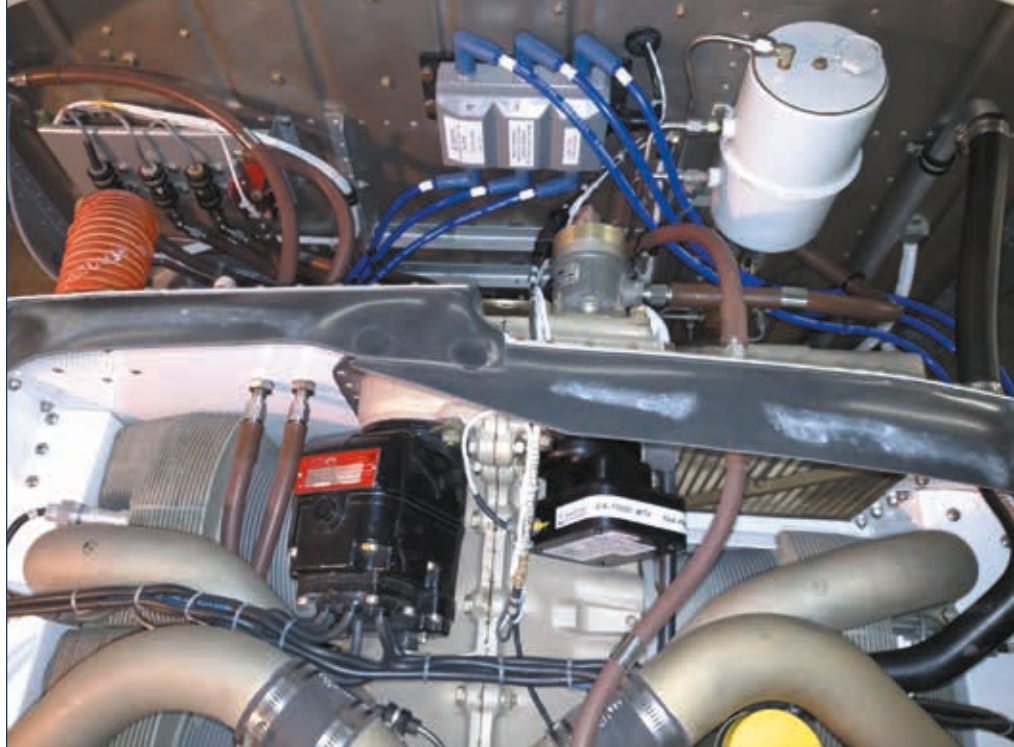
The system has four main components: a manifold pressure sensor, direct-fire coil pack, electronic control unit and a mag timing housing. There is also a set of high-tension cable leads with terminals installed provided with the kit.

Timing is picked up by a "60 minus 2 tooth" trigger wheel with a single magnetic pickup; it provides a high-resolution signal feeding continuous RPM information to the control unit—similar to automotive units in the 1980s.

The dual microprocessor electronic control unit receives RPM and manifold pressure information and advances the timing to compensate for altitude and throttle position based on proprietary and patented algorithms. Timing can be advanced as much as 20 degrees.

The direct-fire coils are the reason the system can produce 70,000 volts to the plugs. In addition, the spark produced lasts through 20 degrees of crank rotation versus five for a mag. This creates a hotter, longer-lasting ignition source. It also improves starting and reduces spark plug fouling—something owners we spoke with confirmed. Because of reduced plug fouling with the EIS, Electroair recommends installing it on the bottom plugs as they are more prone to fouling.

We were curious as to why both



mags were not replaced. Company co-owner Mike Kobyluk explained that replacing just one mag gives 85 percent of the performance increase that would occur with the EIS in place of both mags. Certification requirements for an EIS that replaced both mags would require dual, independent electrical power sources, causing the cost to skyrocket.

REMAINING MAG

Because the remaining mag still fires at 25 degrees before TDC when the EIS has advanced the timing, the spark it creates occurs when the combustion event is underway, so its spark is wasted. It's why the system is sometimes referred to as a "wasted spark system." Having a 12,000-volt spark in the midst of a 70,000-volt spark-created combustion event doesn't do much to help the event and doesn't hurt it.

However, because the mag is still there, doing its job, should the EIS fail, the mag performs its backup role as a normal magneto to keep the engine running.

We do note in passing that should engine roughness develop in flight, whether it is on a dual-magneto system or single mag and EIS, that an important step in troubleshooting the problem is to do a mag check. If one mag, or the EIS, is causing the engine roughness, shut it off. Continuing to allow a malfunctioning magneto (or EIS) to run risks the mistimed spark causing pre-ignition

and/or detonation, which can cause catastrophic damage to the engine.

We bring this up because during our recent visit to Electroair we were told that they'd been contacted by an FAA inspector working on a matter in which a student pilot flying an EIS-equipped airplane experienced engine roughness. The student found that the single mag installed was causing the roughness and shut it off, continuing the flight with the EIS to a safe landing.

Amazingly, to us, the FAA inspector felt that the student should have left the bad mag on. Electroair personnel were able to provide the inspector with data on the seriousness of the risk of continuing to run a bad mag. Their follow up revealed that some pilots are not aware of the need to shut off a mag that is malfunctioning.

WHAT'S IT GOING TO COST?

List price of the four-cylinder system is \$3570—price for the six-cylinder system is \$4950.

Installation time varies, according to Kobyluk and owners we spoke with. The system is going into a legacy airplane that may have had a number of modifications, so installation will require some planning. Les Ojala, director of maintenance at AVflight in Lansing, Michigan, told us that going over the installation instructions carefully, before doing anything, pays off because much of the installation involves determining

ELECTROLAIR EIS IN SERVICE: TWO OWNERS' PERSPECTIVES

While at Electroair, we asked to be put in touch with owners who had installed its EIS and would be willing to speak with us about their experience of using it for the type of flying they do. I'm not sure we could have gotten examples from further apart on the personal flying continuum had we tried.

We first met Jim Huber at Avflight on the Lansing, Michigan, airport where he keeps his A36 Bonanza. That's it in the upper photo with maintenance technician Jordan English taking a look at the Electroair EIS Huber had installed just over a year ago.

Huber, a former Air Force pilot, said that he generally tries to do some sort of upgrade to his airplane each year and the Electroair EIS rose to the top of the pile of prospects due to the type of flying he does. Because his grandchildren live in Dallas, he and his wife regularly use their Bonanza to fly there for visits. The problem that he had was that it is a five-hour flight and even with tip tanks, he could not make the trip nonstop and have adequate fuel reserves to meet his personal minimums—for him that means IFR fuel reserves plus an extra margin for comfort.

In the search for a solution Huber considered larger tip tanks, but then started reading about the performance improvements possible with Electroair's electronic ignition. He said that "even if the system only delivered half of what was claimed" he'd have what he needed.

Huber told us that installation took some time as it was the first one his shop had done. He said that the techs kept a computer with the installation instructions displayed parked on a rolling table right by the airplane so they could refer to the instructions easily—something that was helpful. The techs made "three or four" calls to Electroair and got fast, accurate answers to their questions. There were no problems following the installation.

Because of his military background, Huber logs his flights in some detail. On his flights to Dallas—and other multiple-hour trips—since installation, Huber told us that he followed his usual practice of flying at 9000 or 10,000 feet at the power setting he ordinarily used. His fuel burn has dropped by 1.5 to 2 GPH and true airspeed has averaged five knots faster. The combination, over a five-hour flight, now gives him fuel reserves that make it comfortable for him to make the Lansing-Dallas run nonstop.

Huber said that the performance benefits are less no-

ticeable when flying lower, although the rate of climb has increased at all altitudes.

Airshow pilot Spencer Suderman had a fairly straightforward goal: He wanted to break the record for the number of turns in an inverted flat spin. That meant climbing as high as possible to enter the spin. On the way down the engine had to put out as much power as possible to minimize the altitude loss per rotation.

His initial attempt, in a Pitts S2B, was unsuccessful even though he'd been able to climb higher to enter the spin than the record-holder. In discussing the matter of power, Suderman received suggestions to advance the timing of the engine on the ground so it would make more power at altitude but to be careful not to detonate the engine during the first portion of the climb. It didn't sound like a great idea.

Suderman then learned of Mike Kobylik and the work being done at Electroair with electronic ignition and advancing engine timing automatically. At the same time, Electroair wanted to get an STC for its EIS on a six-cylinder Continental engine, so it was agreed to install a conforming prototype of the EIS on Suderman's Pitts so he could have a go at the record and get

sophisticated operational data on the EIS for certification, although not simultaneously.

The additional power allowed Suderman to climb 10 percent higher—previously the Pitts topped out at 21,000 feet. Now he was able to get above 23,000 feet.

On the record attempt on March 13, 2014, Suderman entered an inverted spin at just above 23,000 feet and made 81 turns before recovering at 2000 feet AGL.

Suderman next moved to a modified Pitts S-1—a Sunbird S-1X—for its more rapid rate of rotation. Working with Electroair, he installed the EIS on the airplane's O-540 engine. On March 20, 2016, Suderman climbed to 24,500 feet and started spinning. He completed 98 turns before recovering at 2,000 feet AGL (lower photo).

Suderman told us that the extra power provided by the Electroair EIS was one of the reasons he could break the spin records while noting that with only about 1.5 hours of endurance in the S-1X, he's not able to take much advantage of the reduced fuel consumption available with electronic ignition. However, he did point out that when going to high altitude he didn't have to deal with heavy, pressurized magnetos, another EIS benefit.



Four-cylinder EIS set up for the bottom plugs on a Lycoming engine. Coil pack is installed low on the firewall, upper photo. Electroair's vertical and horizontal ignition switch panels designed to replace rotary magneto switches, lower photo.



where to put components. He also recommended calling Electroair as soon as a question comes up.

The installation instructions are on the website—a practice we wish more manufacturers would follow—so a potential buyer and her or his shop can look them over in detail before making a purchase. Kobylik told us that often technicians spot potential installation challenges because of their knowledge and experience with the particular airplane—and they'll then call Electroair to get answers. Electroair's customer support personnel are all A&P mechanics and pilots; each has some 40 years of experience swinging wrenches.

Kobylik recommends allowing two days for a four-cylinder engine—one day for the install and one day to take care of the little things that always seem to come up. For a six-cylinder engine, he recommends three days—two for the install and one for everything else.

Electroair has set up a network of approved installation centers and has been collecting installation data from technicians in the field—problems they've had, best places to install components on various types of airplanes as well as effective troubleshooting techniques—and shares the information with the centers. At least one maintenance technician from each approved center has been to Electroair for training.

Kobylik said that where the company sees problems in the field, they almost invariably arise from incorrect installation—the instructions have to be followed precisely.

PERFORMANCE

The selling point of electronic ignition, beyond reliability and longevity, is performance. Optimizing the combustion event via advancing the timing and providing a longer,

hotter spark means that each event will burn the fuel more completely, resulting in greater power output. It's a no-brainer that was learned in the automotive world years ago.

The question for aeronautical use is how does the additional power output translate into performance in the air. Electroair forecasts fuel savings of one to two GPH and some degree of cruise speed increase—and points out that the benefits of spark advance increase with altitude.

Kobylik collects performance data provided by customers and shares it on the company website. A turbo-normalized Comanche owner stated that using the same power settings he used prior to installing the EIS, he is burning two GPH less for the same true airspeed. The same results were noted by the owner of a Piper Saratoga—fuel burn reduced by two GPH for the same true airspeed. Users advised that the fuel savings was the same when operating rich or lean of peak. Some noted increased smoothness when operating lean of peak.

A flying club operating Cessna 172s reported a reduction in average fuel consumption of 1.25 GPH according to the records it kept on fuel consumption on club airplanes.

IGNITION SWITCH

Electroair also offers a \$269 replacement for the rotary key ignition switch and starter found in most aircraft. The benefit is getting rid of a switch that is subject to ADs and replacing it with rocker switches that identify which activates the magneto and EIS as well as using a push-button start. Kobylik touted the replacement switch as safer because the pilot is less likely to do a hurried RPM drop check during runup.



Installation requires finding panel space. We don't have a strong opinion on the replacement switch although we do like flying airplanes that have toggle switches for the mags, such as Cessna twins and the American Champion line. Plus we don't have to worry about strapping in and then realizing that the ignition key is still in a pocket.

We are watching two new products Electroair is developing: a combination magneto/EIS replacement for the long-maligned Bendix dual mag and a spark plug with an automotive-type end.

CONCLUSION

What we've seen in terms of performance increase available via a high-energy, variable timing ignition system over conventional magnetos causes us to wonder why they are not on all OEM aircraft. For someone who routinely makes flights of at least two hours at moderate or high altitudes, we think Electroair's EIS is a no-brainer. Not only should the money saved in reduced fuel consumption and not having to repair or replace one of the mags every 500 hours pay for the system in a few years, the increased overall reliability of the ignition system and improved rate of climb may be thought of as increasing the level of safety of the airplane. Any cruise speed increase is gravy.

SUREFLY'S SIM DROP-IN IGNITION

Texas-based SureFly was created by the folks who launched Sky-Tek (starters) and Plane-Power (alternators). After selling the companies, the focus has been to earn an STC for the SureFly Ignition Module, called SIM for short.

The SIM concept is simple and was created in less than 30 days, but FAA certification has been dragging on far longer than expected—a couple of years so far. The goal was to make the SIM installation as easy as possible. Like Electroair's ignition, the SIM electronic ignition module replaces only one of the magnetos and is completely solid state. It also uses standard ignition wiring harnesses, but there's no impulse coupling because the system controls the ignition timing by manifold pressure and RPM.

Rather than using spinning magnets and a bunch of anachronistic parts, the SIM electronically converts battery power into a high-voltage signal and pulses it to the right cylinder at just the right time. That's a SIM module sitting to the left of a Slick magneto in the main image in the center of the page, and the drive side of the module in the photo at the lower left of the page.

One SIM unit is basically the same size and weight as a Slick mag and a couple of pounds lighter than a Bendix. There are no moving parts, it's fully electronic, it requires no software

updates and it mounts to the engine the same way a traditional magneto does.

The SIM can be adjusted to any engine's base timing advance (specified on the engine data plate) by a switching module that is accessible through a large port on the case. Through



electronics, there is more spark energy throughout the RPM range and the dwell is adjusted automatically. Each spark plug has its own dedicated coil, virtually eliminating coil failures.

SureFly said an experienced technician should have the installation completed in roughly an hour or so, but that might not include access and disassembly, and of course paperwork and testing at the end. One of the reasons for an easy installation is there aren't remote boxes and additional components to put on. The SIM retains the existing spark plugs and the magneto switch on the instrument panel.

For installation, a power wire, ignition switch P-lead and manifold pressure connection are required, and the engine's RPM signal is picked up within the SIM module from the crank gear. SureFly says the SIM is designed to last throughout the TBO of the engine for which it's installed,; there should be no downtime for regular inspections, no messing with

the timing or risking the possibility of failures due to these inspections/adjustments. But unlike the Electroair's variable timing system, the SureFly SIM isn't exactly intended for serious performance gains. Instead, think of the SIM as a simplified, maintenance-free ignition system without points, condenser, rotor and cap.

But SureFly does make claims of increased spark energy throughout the engine's RPM range and that has everything to do with solid-state ignition timing. A long spark dwell promises consistently easier starts, especially on engines with oil-soaked spark plugs. Below 400 RPM, the timing is set to TDC (top dead center, or the position farthest from the crankshaft), with

a longer dwell and increased voltage. There's also the potential for better fuel efficiency in cruise flight thanks to more consistent fuel burn in the cylinders.

There are several models of the SIM depending on the engine and magnetos. The 3.6-pound SIM4P module is for impulse-coupled magneto replacement and the majority of four-cylinder applications will use this one. It uses the existing impulse-coupled drive gear, the drive adapter and the mounting studs. The 3.4-pound SIM4N is for non-impulse-coupled magnetos on both Lycoming and Continental engines, where it plugs directly into the rear of the engine. There's also the 5-pound SIM6L and SIM6C for replacing the mags on other Lycoming and Continental engines.

SureFly's general manager, Jason Hutchinson, told us the company is hoping to secure FAA certification for the SIM this coming summer, which will be via an AML-STC, encompassing both the engine and the airframe in which it's installed. Pricing for four-cylinder applications will start at \$1250 and six-cylinder applications will start at \$1550. Contact www.surefly.net and at 817-373-5161 in Granbury, Texas.

—Larry Anglisano



Garmin's Portable WX: ADS-B, SXM Or Both

Garmin's new portable traffic and weather interfaces complement the company's low-cost ADS-B Out system. Play it on tablets, portable navigators and panel displays.

by Larry Anglisano

With little fanfare, last fall Garmin released the GDL82 low-cost (\$1795) ADS-B Out solution. Along with the uAvionix SkyBeacon, we think it makes practical sense for lower-end aircraft. Read about both in the February 2018 *Aviation Consumer*.

But since the GDL82 doesn't have ADS-B In, you'll need to select a portable solution if you want ADS-B weather and traffic. Garmin covers all the bases with its new GDL50-series portable weather receivers. But with no fewer than six different models (including remote-mount versions) deciding which one suits your flying will take some thought. If that's not enough, you'll need to decide whether to play the traffic and weather data on a tablet, on a portable GPS or on a panel display.

In this article we'll help sort it out with a look at the GDL50-series hardware options and how they interact with Garmin's Pilot tablet app and portable GPS units.

THE HARDWARE

We looked at the GDL51 in the portable SiriusXM roundup article in the November 2017 *Aviation Consumer*, and since then Garmin

The ADS-B/SXM-equipped GDL52 and aera660 portable GPS, right, turned out to be a reliable combo for fetching weather without an internet connection. If an ADS-B signal won't work on the ground, SXM generally will.

has expanded the line. The new GDL50 series replaces the GDL39 3D portable ADS-B/GPS receiver. While we always thought the GDL39 (and remote GDL39R) was a good performer, the footprint was a bit bulky for stashing on top of the glareshield.

The new devices are completely redesigned and all three portable models (GDL50/51/52) share the same chassis. They stand 4.9 by 1.3 by 3.4 inches, weigh .75 pounds and have built-in antennas, but have inputs for external antennas. The receivers have an anti-skid base to keep them from sliding around when on the glareshield and Garmin has a securing base mounting bracket and a suction cup mount for the cable.

The base model is the \$799 GDL50 and it's equipped with a

CHECKLIST



If you're a Garmin Pilot app user, a GDL portable has a rich traffic and weather interface.



The GDL52 receives SiriusXM satellite weather and entertainment, plus ADS-B data.



Garmin's portable receivers won't work with third-party tablet apps.

dual-channel (978/1090 MHz) ADS-B In traffic receiver. There's no ADS-B Out, of course, but the device outputs the ADS-B data via Bluetooth to tablet, smartphone and Garmin portable GPS displays. More on that in a minute.

Power comes from an internal lithium-ion battery that runs for nearly eight hours when fully charged with the supplied Micro-B USB cable. The device is stone simple to operate. There's a power button on the left side of the case, plus annunciators on the front that show status of the battery, receiver and Bluetooth connection.

Priced at \$699, the GDL51 is a SiriusXM receiver and doesn't have an ADS-B receiver, although it does have a built-in WAAS GPS for send-



CHOOSE YOUR DEVICE, WX SOURCE



Once the GDL52 receiver is connected with the Garmin aera660 GPS and/or a smartphone (image in the upper left), you select the source of weather you want to display. ADS-B won't always work on the ground, but SXM generally will. The Nexrad and winds images shown on the aera660 in the upper right and on the Garmin Pilot app on an Apple iPhone 7 in the lower right were delivered by SiriusXM.



ing position, speed and backup attitude data to Garmin's Pilot app and select portable GPS units.

The flagship device is the GDL52 and it's priced at \$1199. It has a dual-channel ADS-B receiver, WAAS GPS and also a SiriusXM receiver for broadcast datalink weather and SXM entertainment. Let's take a look at how these devices interface with Garmin's Pilot app and portable navigators.

WEATHER OVERLAY

The GDL50-series Bluetooth receivers connect with a Garmin Pilot subscription-equipped smartphone or tablet (iOS and Android) via the Connex tab in the main menu. Once connected, the Connex submenu shows the status of the ADS-B and SiriusXM receiver. For ADS-B, you can see active ground stations and the signal quality. Unless you're in close proximity to the ADS-B ground station, don't count on reeling in weather products when you're on the ground. This is a major benefit of the SiriusXM-equipped

GDL51 and GDL52, as SXM generally works reliably on the ground.

If you're interfacing the GDL with the aera660 portable GPS, a dedicated Weather tab is where you select the weather data source—either GDL FIS-B weather or SiriusXM. No, you can't display both sources of weather at once, but Garmin's software is smart enough to display the more current weather products of the two. If you select the Auto tab, the system defaults to SXM as long as the GDL51 or GDL52 receiver is connected.

If a weather product has yet to be received by SXM, the system is also smart enough to display the equivalent FIS-B ADS-B product, if it's received. The receiver can queue the weather from ADS-B and/or SiriusXM while the display device is sleeping or turned off so it automatically updates when you power the screen back on.

The Products tab on the aera660 Weather page is where you select which weather products you want to see, which in the case of the SiriusXM receiver will be governed by which SXM subscription you own. Both the

aera660 and Garmin Pilot app are equipped to display Nexrad composite and base reflectivity, satellite mosaic, echo tops, winds aloft, temps aloft, lightning, storm cells, METARs, AIRMETs, SIGMETs, TFRs, PIREPs, freezing level, turbulence and icing forecasts.

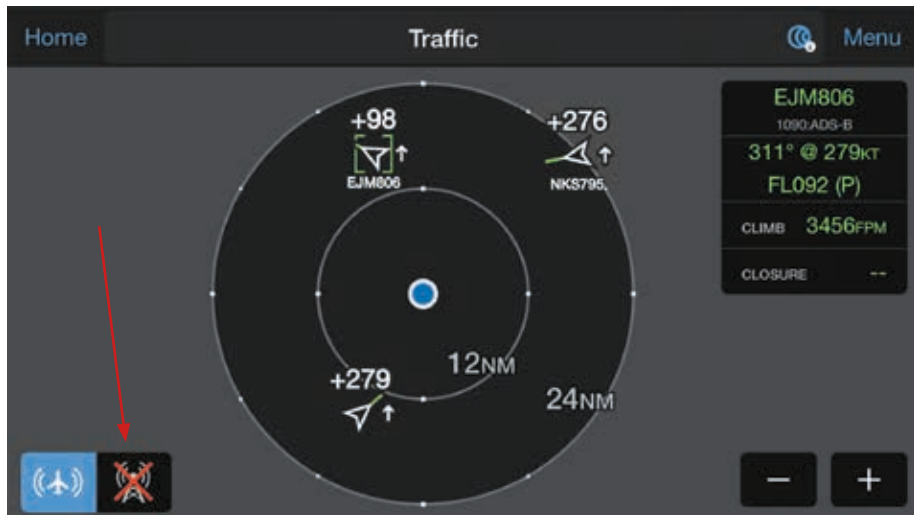
The aera660 also overlays the weather data on the Map page when you turn the Weather option on in the Map Options submenu. You can also animate the weather.

SMART TRAFFIC, TOO

The GDL51 device doesn't have traffic alerting capability because it's strictly a SiriusXM receiver, but the GDL50 and GDL52 receive air-to-air and rebroadcasted ground-to-air TIS-B ADS-B traffic. Traffic alert symbology is automatically displayed on the Garmin Pilot app/aera660 GPS map display and on a dedicated traffic alert page.

The GDL50/52 ADS-B receivers automatically adjust the traffic advisory (TA) sensitivity level to reduce nuisance alerts. For example, traffic

That's a screen grab of the GDL52's ADS-B traffic data, top. The arrow points to the on-screen graphic that shows it is outside of ground station coverage. The GDL's anti-skid base did a good job of keeping the receiver in place on the glareshield of our Mooney test bed, middle, but we suggest securing it with the bracket. The remote version of the GDL, bottom, has both Bluetooth and hardwired connections.



alerts are issued when the threat traffic is predicted to be within a specified volume of airspace around the host aircraft in a specific amount of time. Of course, if your aircraft isn't ADS-B Out equipped, you'll likely miss some traffic that might otherwise be uplinked from a ground station.

Worth reviewing is that ADS-R coverage (ground station traffic re-broadcast) is provided when an ADS-B Out-equipped aircraft is within range of an ADS-B ground station. That means if you aren't an ADS-B Out participant or you aren't within range of a ground station (that's rare) the GDL50/52 won't receive ground station data uplink. So if you fly along with your GDL50/52 without having ADS-B Out, you may piggyback off an aircraft receiving ADS-R and TIS-B, resulting in a partial picture of the surrounding traffic.

But in a full-up ADS-B Out interface, the GDL50/52 portable receivers provide an advanced traffic interface thanks to Garmin's TargetTrend relative motion software. TargetTrend is used on Garmin's panel displays—everything from the GTN retrofit navigators to the G1000 through 5000 integrated avionics suites—and it's also embedded in the Garmin Pilot app and in the software of the aera660 and GPS795/796.

TargetTrend—which is velocity based—gives you a real-time indication of where the traffic target will

be in respect to the aircraft's position as it flies along. On a traditional traffic display you might be able to figure out where the threat target is moving, but you might not be able to figure out if you'll overtake it or not. There's also Terminal-Traffic that enables ADS-B surface targets to be overlaid on the SafeTaxi georeferenced surface diagram within the Pilot app and on the portable navigators.

HOW MANY DISPLAYS?

We like that the GDL receiver can connect with multiple devices/displays at the same time. For example, with the optional power/data interface harness you could hard-wire the GDL to two additional displays, for a total of four when you count the two Bluetooth displays. Maybe you have the GDL connected wirelessly to an iPad and also an iPhone but also want to connect to a hard-wired aera660 or GPS796.

Since the GDL51 and GDL52 receive SiriusXM entertainment programming, you can access SXM channels directly on the Pilot app and wirelessly connect the audio to a Bluetooth-equipped audio panel. The GDL51/52 also have wired audio output (a 3.5 mm stereo jack) for wired music out.

HOW YOU MIGHT CHOOSE

All new GDL models come with a



one-year subscription to Garmin Pilot, which you'll need to interface the devices to a smartphone or tablet. No, ForeFlight won't work.

Which model GDL you select really comes down to whether you want SiriusXM or not. If you must have weather data on the ground when an internet or cellular connection isn't available, the GDL52 is a top pick because you'll get reliable weather, plus ADS-B traffic.

But if you can live without weather data on the ground, save the \$400 (and the SXM subscription, although there's a \$200 rebate if you sign up) and go with the base GDL50.

Contact www.garmin.com.

YouTube See a video of Garmin's GDL50 series at <http://tinyurl.com/j95ht2a>.



AIRCRAFT FLIGHT TRIAL

Vashon Ranger: LSA V2.0

While it's not cheap, the Ranger is generously equipped and mid-priced. Will respectable performance and a cavernous cabin make it a hit?

by Paul Bertorelli

A favorite topic of post-flight bar-room chatter is anguish over the price of new airplanes and the heartfelt conviction the industry could build a \$40,000 airplane if it

Buyers want the Ranger's two panel option, not the basic single, lower photo. Except for the downturns, forward view is uncluttered.

adopted automotive manufacturing methods. If you're a believer in that, your ship has arrived in the new Vashon Ranger LSA.

But it doesn't cost \$40,000, it's \$100,000 and it may be a push to deliver on that. Against the limits of low volume, the Ranger at that price is still a high-value proposition and the company—an offshoot of Dynon Avionics—sees the Ranger as potentially



CHECKLIST



At \$114,500 generously equipped, the Ranger is mid-priced.



Large, wide cabin is a big plus. Handling and habits are pleasant.



O-200 is adequate, but we wish the engine's tech matched the airplane's tech.

nothing less than a modern iteration of the Cessna 150, with a dash of modest adventure flyer thrown in.

At press time, Vashon hasn't officially launched—that will happen at AirVenture 2018—but the company has built a half dozen production examples and is filling its order book before even having a proper factory.

The Ranger tests multiple notions. Can a generously equipped LSA priced at \$100,000 to \$115,000 achieve sufficient volume to be profitable? Will it find traction in a training market heretofore biased against light sports and does the idea of an outback/adventure LSA you can sleep in resonate with buyers? And is the Cessna paradigm about to fade as Textron loses interest in piston airplanes and tapped-out 150s and 172s finally expire?

HIGH VOLUME

Vashon is the brainstorm of John Torode, who amassed wealth in the semiconductor industry and combined that with a lifelong interest in aviation to build Dynon Avionics. Dynon is a fixture in experimental aviation and lately has been giving Garmin a run with its low-cost retrofit EFIS suites for the Cessna 172. Torode would apply the same strategy to airframes.

"The history of my business career has been to bring the cost of something down so the volume goes up," Torode told me in an interview at the company's Woodinville, Washington, factory. "We did it in early PCs, in plotters, in semiconductors and I've been interested in aviation all my life. It's so expensive now in constant dollars that only old geezers like me can afford to fly," he says.

That gave rise to the Vashon Ranger,

Strip the seats out, top right, and it's party time. Vashon paid attention to landing gear heft. Center photo shows main attach point, lower photo the nosegear weldment.

an airplane built to ASTM standards and thus liberated from FAR 23's onerous certification hoops, but also saddled with the ever-more-arbitrary 1320-pound weight limit, but with the 1430-pound option for eventual floats. Torode had in mind a design tailored for efficient production, but one with some unique attributes, including a wide, long cabin, what he describes as a "real aircraft engine"—the Continental O-200D—and a sophisticated avionics suite well integrated with the airplane's relatively simple systems.

And that's what the Ranger is. It's all metal with weldments forward for the engine and nosegear, with a single-piece riveted aluminum cantilevered wing so as not to be cluttered with wing struts. And with an overlarge cabin that gives the Ranger a vague pregnant guppy look from the outside, Torode and designer Ken Krueger see the airplane appealing as both a trainer and flying RV.

To that end, the seat cushions strip out in about a minute and the seatbacks fold forward to open up the entire cabin as a potential bed for two. It's 78 inches from the aft bulkhead to the sticks and at the widest, the cabin's interior dimension is 45 1/2 inches. There's plenty of room to move around inside except for the largest of occupants but plenty of room even for them when configured for flying. The rudder pedals slide to accommodate the tall and the short.

The standard Ranger—which no one seems to be buying—prices at \$99,500 with a single Dynon HDX system. The top-selling premium model, with two displays, sells for \$114,500, with a single VHF radio. The HDX system is fully integrated into the airplane, with bleeding-edge stuff like electronic circuit breakers through an integration module, full engine monitoring (including fuel flow), ADS-B In and Out, an angle-of-attack system and a full-featured autopilot that includes the now-routine level button. The Ranger doesn't give up much to a near-million-dollar Cirrus in avionics sophistication.



When I got inside the Vashon shops, I gravitated straight to the landing gear attach design. This, more than anything, has been a sore spot for flight schools' reticence to adopt LSAs. Krueger said the company made both the nosegear—a heavy steel weldment—and the main gear as robust as possible.

"We can't throw a lot of things at it because of that weight consideration. That's valid for any airplane, doubly so for a light sport where we have a fixed takeoff weight," Krueger says. The main legs are laminated fiberglass bolted into heavy cross braces between floor spars. To prove both structure and production techniques, the company built eight prototypes before settling on flight hardware. Some were used in drop tests to prove the gear.

JUST LIKE CARS?

If Vashon hopes to be profitable with the Ranger at \$114,500—and Torode says that's an unknown thus far—it can suffer none of the production inefficiency that seems to dog light aircraft building. To get there, it has adopted what is the most efficient production strategy I've seen yet. Production chief Scott Taylor, who did stints at Boeing and Glasair, describes the factory strategy as marrying existing technology to the light aircraft realm—call it ambitiously evolutionary rather than revolutionary.

Squatting in the center of the production floor is a giant—and expensive—CNC turret punch capable of match holing for most of the airplane's sheet metal parts. And when it punches, it also dimples so the airplane has the clean look of flush



riveting, even though the holes aren't countersunk. Vashon buys the skins pre-painted white and does the match holing, bending and shaping over a protective film. Like the all-green airplanes emerging from Boeing's Everett works immediately next door, Rangers are all white. The trim color comes from automotive-style vinyl appliques that can be customized. The demo Ranger had a tasty evergreen and mountain Northwest-themed scheme.

Most of the interior parts are CNC laser cut and Vashon has invested in but not yet deployed a robotic welder. Is robotic riveting an option? Taylor



moral judgment; a passing observation. The O-200 has one advantage over the Rotax and that's its flyability. With a heavy flywheel and prop, its throttle response is more damped than the Rotax's nervous reply to throttle



says it's not out of the question, but remains an unknown until

production economics mature. For now, assembly is heavy on handwork. Fabrication happens in a shop behind Dynon's HQ in Woodinville, Washington, with final assembly at Everett's Paine Field. Vashon plans a new, integrated factory at Arlington, Washington.

FLYING IT

The Ranger's flight characteristics are exceptional for not being exceptional. It flies like it looks with no surprises. Any LSA with 100 HP will climb at about 750 FPM and cruise at around 100 knots and the Ranger does that.

The O-200D is a curious choice, for it is an old-school if recently lightened engine in a cutting-edge airframe. Torode sees an appeal in a traditional aircraft engine and not a Rotax, which he argues still has the perception of being difficult to maintain, even if the market seems to have overcome that. Older pilots who may constitute individual buyers may prefer the O-200.

But it has two disadvantages: It's 50 pounds heavier than the equivalent Rotax and because it's carbureted, it's susceptible to carb ice, which is a leading cause of Cessna 150 accidents.

As LSAs go, the Ranger is on the heavy side. According to the POH, the demo airplane weighs 882 pounds for a useful load of 438 pounds. That's only 8 pounds less than the max allowable empty weight.

With two FAA-standards aboard, that leaves capacity for 16 gallons of gas; plenty for training, but not long cross countries. Of course, in the real world, like it or not, the 1320-pound LSA weight limit is the most widely fudged limitation in aviation. No

commands and the exhaust note is certainly more satisfying.

The Ranger's control heft is similar to that of heavier airplanes, say like a 172 if a 172 had control sticks, as the Ranger does. There's hardly need for any rudder and the airplane is nicely trim stable, especially on approach. Trimmed for 65 knots indicated, it stays there without much fuss. It has barely discernible pitch up on flap deployment, so on application of full power, a trim-tab stall is unlikely.

Stalls themselves are benign. It takes willful stick holdback to get a stall at all and once entered, there's no break or roll off, but a gentle parachute mode easily held level with aileron; no need for rudder. I greased the first landing easily, and the landings after that, too. However, it does take concentration to keep the nosewheel from touching down before you want it to. It doesn't slam down, but alights firmly in a way that makes you think not to let it do that next time. Ken Krueger told me his goal was to make a pleasant flying airplane and the Ranger certainly is.

The cabin width is ginormous, more like a Bonanza than an LSA. With no struts, the optics out the side windows are panoramic and constricted forward only by a pair of downtubes. Vast acreage of glareshield provides a momentary place to put stuff. You could cram even more in the huge baggage compartment, which has a 100-pound limit. But that won't be useful with two aboard. One ergonomic touch I liked is that the flap switch presets to 20 and 40 degrees and is placed so you can fingertip it while manipulating the throttle. Nice.

If I have any complaint about the Ranger, it would be the fuel system. The airplane has a 2.5-gallon header tank located inside the cabin behind

Build time is sharply reduced thanks to a CNC turret punch that match holes and dimples parts at the same time, inset.

the firewall. The two 14-gallon wing tanks feed into it. Krueger says the header is practically "nuclear hardened" against crash damage, but still, modern design trends are to keep fuel out of the passenger space.

This concern may prove unfounded; we can only await crashworthiness history to know for sure. On the plus side, the header acts as a 30-minute reserve and a warning light on the HDX informs the pilot of low fuel in the header. Another plus: The Ranger has five-point harnesses. These are rarely seen in any airplanes, much less LSAs.

CONCLUSIONS

In my view, the Ranger is a rethink of the LSA idea but not a reinvention. Its efficient production plan will keep the price lower than the competition, but will it be low enough to ignite demand? This much we know: The upper end of the LSA price spectrum hovers around \$160,000 or higher and these have been the top sellers. Cheaper hasn't equated to higher sales.

The Ranger's fate, at least in the training market, may be tied to influences beyond the company's control, such as what Cessna and Piper do in the training market and whether Vashon can disabuse flight schools of their biases against LSAs as trainers. Furthermore, if the arbitrary LSA weight is lifted, Vashon will have some additional engine options, which could be transformational. Torode hinted that the company is exploring other engine possibilities. I mentioned to Ken Krueger that I thought the airplane is capable of 1500 pounds gross, at least. He didn't disagree.

For now, the Ranger is honesty writ in metal. It is exactly what it appears to be: A pleasant flying airplane with good performance and handling, exceptional cabin comfort by dint of size and impressive potential as a trainer. Whether that's enough to displace the 150 as the King Dog of all trainers is yet to be determined.

YouTube See a video of the Ranger at <http://tinyurl.com/j95ht2a>.

Insurance Market Scan: Overcapacity, Still Soft

Aviation insurance industry insiders all concur that the market could soon harden. Aging pilots and those with recent claims might be the most vulnerable.

by Jon Doolittle

Every few years we take a close look at the U.S. general aviation insurance market. During the research we speak with underwriters and brokers to get a feeling for what changes they see, what problems they are having and what they anticipate coming down the track for those of us who write premium checks.

The past several market surveys we've done have turned up some things that are continuations of past trends, and occasionally we come across new things. This time we found a combination of the two that leads us to believe there are some changes—albeit gradual—that will affect your premium and for some, the ability to even get a policy for a step-up aircraft.

LOSS EXPERIENCE MATTERS

The factor that you might think would have the greatest external effect on the aircraft insurance market is the number of aircraft accidents

that occurred, but this actually changes very little from year to year. Inflight loss of control remains the leading cause of fatal accidents, and the rate of accidents per flight hour remains within a few percentage points of what it has been for almost 10 years.

The fact that's striking when you start to speak with some of the market players is that the aviation insurance market is not a single unified thing. Rather it is a collection of underwriters, each with a slightly different appetite for what kind of business it is going after, each with a slightly different policy form, each using its own rates and most importantly, each with its own experience.

In the insurance business, loss experience plays a large role in helping the insurer decide how to face the next year. Experience helps an aviation insurer to decide what kind of pilots and airplanes to go after, what rates to charge and what limits

CHECKLIST



Thanks to competition, it's still a buyer's market for aircraft insurance.



Some insurers are adding services and additional coverage as gratis.



But the soft market may be short-lived. Don't count on higher liability limits or step-up coverage.

of liability to offer. And while GA accident rates as a whole do not change much from year to year, the number of insured aircraft is not large enough for the claims to be equally distributed among the carriers. The experience of individual companies can be very different from the others in a given year.

If you were the underwriter who had the only fatal Gulfstream accident in the course of the year, your view of the cost of insuring Gulfstreams would be very different from other underwriters whose portfolio of Gulfstreams was loss-free.

Insurers all seemed to feel that their greatest challenge was the continuing overcapacity in the market. When an insurance company writes a policy, it is required by regulators to put away surplus in the form of cash to make certain that it can pay its claims. In a real sense, the amount of money an insurer can raise as reserves is a measure of its capacity to take on new policies. In a very real sense, the cost of money is one of the larger costs that an insurance company faces.

For the last decade, due to the larger economic situation, the cost of money has been historically low, with the Federal Reserve only now beginning to slowly increase interest rates. During the same time, owing to the relative attractiveness of various kinds of insurance as investment

If you're thinking of adding your first twin to the hangar, understand that a deal-winning quote to insure it could change drastically should the market harden.





The fact that aircraft are becoming increasingly more complicated and expensive to repair—models like the newer Cirrus pictured at the top are one example—will inevitably change premium costs and not for the better. Even simpler aircraft like LSAs (that’s a CubCrafters Carbon Cub in the lower photo) aren’t immune.

opportunities, large amounts of private equity—creating overcapacity—has found its way into insurance and reinsurance markets, compounding the problem.

OVERCAPACITY AND A SOFT MARKET

In aircraft insurance, this overcapacity manifests itself in the form of more underwriters in the market (14

to 16 of them depending on how you count, as opposed to just six underwriters 10 years ago) and a greater ability to take on more risk because money is so abundant and so inexpensive.

There are almost twice as many insurers looking to insure general aviation airplanes as there were 10 years ago, and this in a market where new aircraft deliveries are slowing to a trickle. When we asked insurers why they felt that the soft market had lasted so long and become so deep, pretty much all agreed that the main reason was the excess capacity.

“There is way more money chasing the same number of airplanes” was the way one underwriting executive summarized it. The insurance business as a whole is subject to wide cyclic swings, from soft to hard and back again. Sometimes these swings are due to internal factors, and other times due to outside forces.

The problem of overcapacity also

exists for the reinsurers who provide protection to the direct aviation insurers. Most of the reinsurers who provide coverage to general aviation insurers are parts of larger companies that are involved not only in aviation, but also in catastrophic events such as forest fires and hurricanes. Almost all aviation insurers purchase reinsurance to make their results more predictable.

Most underwriters carry reinsurance “treaties,” which are agreements between insurer and reinsurer, spelling out what classes of business can be written and what share of loss the reinsurer takes. These treaties are renewed each year.

Because the reinsurers often share in the fortunes of the direct insurers, it is often the reinsurers who rein in direct underwriters who are having unfavorable results as the result of loose underwriting guidelines, or just bad luck.

Due to overcapacity in the reinsurance market, most of the underwriters told us their reinsurers were saying the right things, but not putting any real pressure on them to push hard for higher rates or tighten up underwriting guidelines.

The result of this has been a lengthy “soft” market, beginning almost 10 years ago. In many ways, this soft market has benefited the consumer. Depending upon the type of airplane you own and the type of pilot that you are, you have probably, absent other changes, seen your rates drop. The decreases are a direct result of this competition.

Over the span of 10 years that this soft market has lasted, not only have rates come down, but underwriting guidelines have also begun to slip. Insurers who required type-specific annual simulator training for pilots of turbines are now often allowing pilots to train in their airplanes.

Underwriters who required annual recurrent training began to allow flight reviews or instrument proficiency checks in its place. In some cases, underwriters began to offer larger limits of liability than their guidelines previously permitted, or to insure airplanes whose insured value exceeded their previous practices.

Another instance of guidelines relaxing is the allowance of so-called dry leases, which in the past might

well have been treated as aircraft rental and surcharged.

AIRCRAFT INSURANCE TURNED COMMODITY

In this competitive environment many of the underwriters we spoke with were frustrated that aircraft insurance is becoming viewed as a commodity. Their companies were reacting in various ways to differentiate themselves and put their brands forward. For years we have seen insurance companies offer value-added services to policies for corporate operators. These included things like safety audits for flight departments, or simulation of emergency response plans.

But it is only fairly recently that we have seen underwriters take this step to reach out to their light aircraft customers. It is easy enough to send a safety expert to visit a flight department that spends \$100,000 and more for insurance each year, but what to do about an aircraft owner who spends \$750 to insure a Cessna 172?

One company (New Jersey-based Global Aerospace) offers a free aircraft breakdown assistance program to each of its policyholders at no additional cost. Others are in the process of building portals onto their websites in order to allow their clients to view their policies on mobile devices, order certificates of insurance or submit renewal information.

Still others are offering insurance through affinity groups. A few offer safety-related webinars aimed at owner pilots. Most have added extra coverages on aircraft policies at little or no additional cost in so-called expansion endorsements.

All of the carriers we spoke with felt that the cost of repairing airplanes was increasing along with most of their other expenses. "Parts are going up, shop rates are going up, it's all going up," said one insurance expert.

Moreover, every single underwriting officer we spoke with said that their revenues were being driven downward by competition owing to the overcapacity problem, while their costs were increasing to the point where many felt that they were reaching the edge of profitability.

Two insurers in slightly different words pointed out that they had seen claims that were larger than usual



Hoping to score coverage for flying left seat in a new jet? If you're a pilot approaching the golden years, it's time to talk with your insurer about this reality—and even how you'll retain coverage if you fly a high-performance aircraft.



due to the relaxing of underwriting guidelines in the face of competition. In both cases, the insurer felt that his company had exceeded its own maximum insured value guidelines and that as a result, physical damage payouts had increased significantly.

WHEN THE BOTTOM DROPS OUT

The irony of the situation is not lost on anyone we spoke to. This is Greek tragedy writ large: Everyone feels that rates have to be increased at some point. Everyone is aware that only they have the power to do that. And everyone, with a few exceptions, knows that if they increase their rates too much, there are still hungry carriers in the market who will undercut them in an effort to take away their customers.

When we asked underwriters what they saw for their businesses and the market for the next one to five years, we got a wide variety of answers. All

acknowledged the seriousness of the overcapacity problem. All agreed that insurance rates for GA aircraft would have to go up at some point, but only one insurer felt that the shift would take place this year.

Most company people we spoke with told us that they were not quoting decreases, and that they were looking for increases on renewals where there had been a claim in the past year.

The other widely held opinion was that it would take one or more catastrophic events like what happened in 2017 to get the reinsurance market to charge insurers more for their reinsurance. For reinsurers who are involved in many areas of insurance, last year was a historically bad year for hurricanes and forest fires.

Whether the general aviation insurance market continues to stumble along, or whether it suddenly reverses course and becomes a hard market overnight, those of us



If you've balled up your high-priced turboprop, you could be an easy target for a rate increase.

who depend upon its product can take some elementary steps to make sure that insurance is available when we need it, and that we don't pay more for it than we have to. There are some specific pilots who should have a plan.

This includes older pilots. If you are approaching your mid-60s and plan to keep flying, we recommend that you talk to your insurance provider about a plan. Some insurers are easing their restrictions on older pilots in the current relaxed environment, but this may very well change with the market. Particularly if you fly a twin, a turbine or a high-performance single—and

especially if you would like to keep 'smooth' limits—make sure that you align yourself with a company who will continue to provide you with coverage and the limits that you need.

Insurers are looking for long-term relationships, plus they are looking for pilots who are flying enough to be proficient and who train regularly. Companies can and will change their guidelines with re-

spect to older pilots, but do your best to find one who will stay with you. If you have a solid, long-standing relationship with an insurer, now might not be the time to jump ship. Loyalty could be to your advantage.

If you are flying under the FAA's BasicMed program, make sure that you ask questions of your broker or provider. Most insurers are treating BasicMed just like a visit to an AME, but this may not hold up if the market hardens. Especially older pilots or pilots who were flying under a special issuance medical may suddenly find that their insurer requires third class medical certification from an AME, even though the FAA no longer does.

You should also consider whether you plan to step up to a more complex or high-performance aircraft—especially a turbine. Ask all the questions

you can. When the aircraft insurance market hardens, underwriting guidelines that have been overlooked may suddenly be back in effect.

Overnight, the quote that you received for a brand-new, \$1,000,000 Cirrus SR22, as just one example, may be no longer valid. Have a backup plan. Maybe spending your first year in a \$250,000 airplane will do the trick. Or maybe you can get a two-year policy in the soft market and have plenty of time in the airplane if the market changes in two years, as many think that it will.

There's also the issue of liability limits. One of the early casualties of the swing to a hard market is higher limits of liability. By that, we mean limits higher than \$1,000,000 "smooth."

If you feel that you need \$2,000,000 or more in order to protect your assets, spend time finding out how available this level of coverage is. If you can't get \$2,000,000 from your primary underwriter, have your provider investigate whether you can purchase excess liability coverage.

INEVITABLE HARDENING

Based on what insurers told us, the aviation insurance market will have to firm up. Our best guess of when is sometime between tomorrow and the year 2030. We feel that there is a fairly widespread lack of profitability among insurers, and that this will cause participants to leave in favor of greener pastures.

There are already small changes going on, as companies adjust their rates and guidelines on types of aircraft or pilots that have had loss experience. If the market is left to its own devices, the change will likely be gradual, and may not happen for another year.

If external forces, like hurricanes, fires and floods, bring about the change, it could be more sudden and more severe. After the terrorist attacks on September 11, 2001, the market turned virtually overnight.

But as we say in New England, if you don't like the weather, wait 10 minutes (or 10 years) because it is sure to change.

Jon Doolittle is a regular Aviation Consumer contributor and the principal of Sutton James Insurance in Hartford, Connecticut.

AIRCRAFT INSURANCE MARKET TIPS

- ✓ Aging pilots should consider staying loyal to one company.
- ✓ Ask your insurer what it expects for training and currency.
- ✓ Earning a new rating shows your commitment.
- ✓ Consider a hardening market when buying a step-up aircraft.
- ✓ BasicMed pilots might have to eventually pass a third class medical.
- ✓ Consider a less expensive aircraft (used), even if it's temporary.
- ✓ If you had a recent claim, you could get hit with a premium hike.
- ✓ The market could change rapidly, based on natural disasters.

Pilot Sunglasses: Flying Eyes, Oakley Faves

But the market is saturated with plenty of other high-quality choices. One brand won't suit all, so select by fit, lens clarity, quality and crashworthiness.

by Larry Anglisano

You don't have to look far into any aviation retailer's catalogue to find sunglasses that cater to pilots. Yes, we know there are plenty of cheaper brands you can find at Sunglass Hut and other non-aviation retailers, and we also know that selecting glasses is as personal as selecting clothing. A cheap pair of drugstore shades may suit you just fine.

Still, since we last did an aviator sunglasses roundup nearly eight years ago, there are some new brands and styles worth looking at to see how they compare to more mainstream models from Oakley and Ray-Ban, for example.

We kept this review contained to eight favorites, based on build quality, versatility and comfort. Inevitably, there will be glasses that work for you that we didn't cover, so tell us about them and we'll include your comments in a long-term follow-up report on how our top picks held up.

EYEWEAR TECH 101

It's worth discussing some of the things to consider when investing in high-end glasses. Styling aside, obviously the quality of the lenses should be front and center. Typically, sunglasses lenses are made from CR-39, mineral glass,

The Flying Eyes Golden Eagle Sport, main photo, impressed with excellent build quality and offered a high level of comfort. The Method Seven Altitude, top, worked well in overcast conditions.

polycarbonate or Trivex. Optics professionals we spoke with prefer polycarbonate and Trivex lenses because of their impact-resistant qualities—something that's an obvious consideration for flying. While CR-39 and mineral glass lenses offer impressive lens clarity, they can shatter.

Dean Siracusa at Summer Hawk Optics in Austin, Texas, reiterated

CHECKLIST



If you fly and play outdoor sports, the Oakley Flak Jacket wins for versatility and durability.



Women might prefer the Flying Eyes Kestrel for its smaller frame.



You won't know which is best for you until you try them. Buy from a source that will take them back.

that all eyewear sold in the U.S. (they're considered medical devices) is regulated by the FDA. They must contain basic UV protection, which has nothing to do with the tint of the lens. While mineral glass and CR-39 need coatings to block UV light, polycarbonate and Trivex materials naturally block UV light. Additionally, modern coatings can now block





The Oakley Flak Jacket, top and inset, is our top pick for flying and outdoor sports. The Flying Eyes Kestrel, bottom, comes in smaller frames for petite faces.

100 percent of all UV light. The "UV400" spec means the lenses will block at least 99 percent of UV light.

We've all heard that polarization is no match for the cockpit because these lenses interfere with some

LCD displays. But there's a common misconception that polarization blocks UV light. It does not. Instead, polarized lenses filter out a specific angle of visible light—useful for cutting glare on the water, as one example—but of no use for UV protection.

And what about photochromic lenses, which darken automatically in sunlight? They're not great in the cockpit because most photochromic lenses use UV light to darken the lens tint. The Transitions brand

XTRActive photochromic lenses have two different materials that darken, based on either visible or UV light. If no UV light is present, they'll still darken a great deal with just visible light being present. Additionally, these lenses will go almost completely clear, which makes them excellent for use at night too. This brand of photochromics is normally only available in prescription lenses. We can attest to their success—we invested in a pair of Flying Eyes prescription sunglasses with XTRActive

lenses and wear them in total darkness and in bright sun. They perform flawlessly.

Last, the frame/lens style you like might not work if you plan to convert them for your prescription. It's no surprise that athletic/sport wrap glasses offer excellent side protection, but few manufacturers can create quality prescription lenses for high base curve frames. We're told the ones that do can only handle spheres up to +/- 3.50.

FLYING EYES

Priced from \$169 to \$194, the original Flying Eyes sunglasses are the Hawk convertible model, which have interchangeable temples (including a nylon strap) that make the glasses headset and helmet friendly. They're also available in non-RX bifocals. In addition to the Hawk, the company recently added a variety of frame styles and all of them have UV400, impact-resistant polycarbonate, prescription-compatible lenses.

We're impressed not only with the Flying Eyes quality, durability and warranty (our prescription Hawks flew off while motorcycling, were crushed in traffic and the company replaced them for the cost of shipping), but also for its guidance. It recently launched a public service website (www.eyesthatfly.com) to help buyers find opticians and ophthalmologists who are fellow pilots. These professionals should better understand the unique requirements for cockpit-friendly bifocals, for example.

The Cooper Titanium model is a classic aviator style and is priced at \$269. It has titanium frames and 1-mm thin Resilamide temples—which are lightweight and virtually

unbreakable. The frame size is 135 mm wide. For smaller faces, the company offers the \$269 130-mm-wide Kestrel Titanium aviator model. They were a favorite for the female aviators during our evaluation.

We've had the Flying Eyes Golden Eagle Sport model in our long-term test pool for a year and they've performed well. We like their durability, clarity and comfort. Like the Oakley Flak (more on them in a minute), the Golden Eagles work well for sports and for everyday use. We like them so much we're converting them for prescription lenses. See the entire Flying Eyes line at www.flyingeyeglasses.com.

SCHEYDEN MUSTANG

California-based West Coast Trends sells the Scheyden Precision Eyewear brand and says its sunglasses (which are made in Fukui, Japan) are engineered to aerospace-like tolerances. We sampled the company's most popular aviation-specific model, the \$309 Fixed Gear Mustang.

The Mustang has a titanium frame and the lenses come in bronze or grey and are available for prescriptions, including bifocals. The Mustang has CR-39 lenses that are available in six-layer non-polarized or eight-layer polarized coating options. We like that the Mustang has spring-loaded slim temples that make the glasses easy to slide on and off while wearing a headset. We also made note of the adjustable silicon nose pads, which added to the model's comfort—no pressure points on the nose. The frames are adjustable (we couldn't snap them) and have an acetate coating on the temple to help block side glare.

Visit www.scheyden.com.

METHOD SEVEN ALTITUDE

This company in Santa Cruz, California (www.methodseven.com), established the first HID specific optics for horticulturists who work in growing rooms and now have the M7 Sky series for aviators. The company is easy to talk with and quickly sent us a sample of the Altitude wrap model.

The \$240 Altitude has oxygen mask/headset-friendly titanium frames and temples, and the crystal-line lenses are available in three VLT (visible light transmission) options. VLT specs indicate the percentage of

The Scheyden Mustang, top, impresses with high-quality frames and high-clarity lenses. The Cloudbase Optics LeeWave, middle (image courtesy of Sporty's), gets high marks for its light weight and flexibility. There are lots of copies, but the Ray-Ban Aviator, bottom, stands the test of time with high-quality lenses and durable frames.

visible light that passes through the lens. The SKY 9 has a VLT of 9 percent—one of the darkest lenses on the market, according to the company. The SKY 18 is Method Seven's all-purpose lens (the sample we tried) and we found that it performed well at dusk and for brightening the horizon when looking ahead at a broken to overcast cloud layer. In fact, the blue tint on the lens almost tricked us into thinking we were eyeballing blue-sky VFR. That might not always be good, in our view.

The SKY 30 is marketed for some older pilots with eyes that might require more light (and those who leave their sunglasses on all day) since it lets in the most light of any SKY lens.

Method Seven's SKY lens technology is a new creation blending the rare-earth element neodymium, which absorbs a range of yellow light that's intended to provide a greater contrast over a wide range of light levels. It gives the lens the blue appearance.

The company also sells the RX



compatible \$240 Ascent Aviator model, made with hand-tooled and serial-numbered Japanese titanium.

CLOUDBASE OPTICS, AV-SUN READERS

Cloudbase Optics has a line of contrast-enhancing glasses that the company says are optimized for glider pilots who depend on seeing nascent thermal cloud formation in a bright, intense lighting environment. Constructed in Italy (the company is in Seattle, Washington), the Cloud-

SHADES THAT WORK FOR FEMALES

Like the aviator watch market, it's too bad that few aviation sunglasses manufacturers cater to female aviators. In general, most models are more appropriate for males, who often have larger faces. For our review, we lobbied the help of several female aviators in a variety of age groups. Their demands aren't unreasonable. Practicality is important.



"Since I'm not in a cockpit full-time and don't have a budget for multiple pairs of shades, my flying glasses need to look good on the street and play well with other activities including hiking, boating and driving. They must also be designed for comfort under a headset," said our own Jennifer Whitley, who wears Serengeti.

"Everyday wear and durability are the most important considerations for me because I want to transition to and from the cockpit without swapping glasses," another pro pilot told us. She invested in the Oakley women's aviator model and couldn't be happier.

Every female aviator who sampled the smaller-framed Flying Eyes Kestrel aviator model liked the fit, styling and performance. "I wouldn't have any reservations wearing these out in a social setting when I'm sporting my sundress and open-toe pumps," said one pilot of the Kestrels.

Another favorite, although not an aviator style, is the \$153 Ray Ban Clubmaster shown on Ashley in the photo to the left. They proved to be durable, comfortable, stylish, versatile and most important, have lenses that work well in the cockpit. What else can a girl ask for?

base frames and lenses from vision specialist Carl Zeiss are made from lightweight and flexible TR90, which is headset friendly.

In addition to the \$109 LeWave, the company sells the \$109 ColdFront square Aviator, the \$99 WarmFront Aviator and the large and small \$109 DustDevil model. All models have a lifetime warranty. See them at www.cloudbase-optics.com.

Kent, Washington-based Airplane Things Inc. has been selling glasses for 17 years and we tried the bifocal AV-SUN readers. The CR-39 lenses

We wouldn't call the AV-SUNs sexy, but they turned out to be economical and good-performing bifocals.



have a grey tint and are available in titanium frames, a choice of various bifocal strengths and with prescription lenses. Visit www.airplanethings.com.

RAY-BAN, OAKLEY, SERENGETI

We remain impressed with the build quality of the \$153 RB3025 Ray-Ban Aviator Classic. Designed for U.S. aviators in 1937, our sample has the gold frame and green G-15 glass lenses that absorb 85 percent of visible light. They did well in bright sun and overcasts. But, they certainly aren't the lightest and they don't work for sports, although they do work for outdoor shooting. For a head-spinning collection of glasses, visit www.ray-ban.com.

Like the Ray-Ban Aviator, the Serengeti 5222 photochromic aviator model is heavy and can be fatiguing, plus it slides down a sweaty nose. But it performed well in a variety of light conditions—always darkening enough to do the job. Better yet, we spotted the 5222s for under \$100 at several mail order houses. That's a substantial decrease from their original \$180 price. See www.serengeti-eyewear.com.

We saved our favorite—the \$163 Oakley Flak Jacket—for last. While they aren't

official pilot's glasses, we like that the Flaks serve equally well in the cockpit as they do for outdoor sports and for everyday wear. The full-wrap, iridium grey HD Optics (HDO) shatterproof lenses are near flawless performers in all lighting conditions, except for total darkness. They fit well with a headset and could be among the most comfortable sunglasses we've tried. Visit www.oakley.com.

TAKE THEM FLYING

That's what you'll have to do to find the glasses that work best for you. Use this review as a starting point. The ones we selected are standout favorites, and some weren't available when we covered sunglasses in the December 2010 *Aviation Consumer*. Use that as a supplement to this latest one.

Worth mentioning is Randolph Engineering in Massachusetts, a government supplier with pilot glasses that performed well in previous trials. We reached out to the company no fewer than three times for a sample and to catch up on its technology, but the marketing/communications department never got back with us. With that lack of communication, we can't recommend them.

We can recommend all the glasses that made this report and we'll follow up in a year with a long-term report.

ADS-B Flight Tests: Ground Check It First

An ADS-B installation isn't done until it's ground tested, flight tested and logged. FAR 91.413 checks don't count.

by Larry Anglisano

The final stages of an avionics installation can be the most critical because that's when the configuration and final testing occur. Unfortunately, it's when a shop can be rushed to the point where you—the aircraft owner—are left holding the bag to test newly installed gear, which includes critical ADS-B equipment.

The good news: Shops that do the most ADS-B retrofits will own the specialized test gear to make sure the system is programmed and properly tested before you fly the aircraft away. The better shops will fly it with you for a final check. But for shops that are less equipped, you'll have to fly it off yourself and eyeball the data on the Public ADS-B Performance Report, or PAPR. Link to this automated tool at <https://tinyurl.com/y9hrtsyw>. It can tell a shop a lot about the system's performance should they have to troubleshoot it.

When the government was paying out rebate checks for ADS-B upgrades, it required specific flight testing and a validation report for conformity. That's no longer the case, but you

might follow similar guidance when validating a new install. The FAA's advisory circular 20-165B provides guidance for ADS-B Out system installations and airworthiness approvals. In it you'll find the recommended flight profiles and maneuvers to perform on the flight test. Worth mentioning is that a typical FAR 91.413 transponder test won't check a 1090ES transponder's ADS-B data output.

RULE AIRSPACE

The first step is to conduct the flight test for at least 30 minutes within published areas of ADS-B coverage and within rule airspace, but this isn't limited to an area within ADS-B ground station coverage. According to the FAA and experts we talked with, flying near the surface or at the fringe of ADS-B coverage areas may negatively impact the metrics provided in the PAPR report. That could lead to unnecessary troubleshooting and tail chasing. This is a good time to become familiar with rule airspace because ADS-B controlled airspace may differ from conventional airspace. As an ex-

ample, ADS-B Class E airspace begins at 10,000 feet MSL, unless noted.

While there is no minimum or maximum altitude, you should fly the aircraft at multiple altitudes and in multiple configurations, including takeoff, cruise, approach and landing. This also includes performing at least two right and left 360-degree turns. See Table 5 in the advisory circular for further guidance on maneuvers, including proper bank angles and climb and descent rates and duration. The profile also requires flying a north/south course that crosses a known waypoint, followed by an east/west course that crosses the same waypoint.

We asked Garmin's avionics product manager, Bill Stone, for some tips on ADS-B flight tests and read him loud and clear that the system should be ground tested first—something that might not happen at all shops, especially those with limited avionics interface experience.

"What we see is in the vast majority of errors discovered in flight testing are specifically installer configuration items," he told us. Keep in mind that there are both static (specific programmed data) and dynamic (GPS performance, for example) issues that can plague a new install. If you don't catch these problems, the FAA's 24/7 ADS-B monitoring system will. Data is being collected (and stored) on all ADS-B Out-equipped aircraft. This may not be limited to ADS-B airspace. If you're consistently broadcasting bogus data, the FAA considers the system non-compliant and you'll likely get a letter stating such.

Last, if you're tempted to tackle an ADS-B install on your own, chances are you don't have all the tools to thoroughly ground test it. As one example, Garmin dealers have access to a diagnostic app that's used with a portable ADS-B In receiver to verify what the aircraft is broadcasting. The instant feedback on system performance saves time, money and guesswork.

Test the ADS-B Out system in multiple aircraft configurations to ensure there isn't signal drop-out and that the aircraft is providing reliable data to the ADS-B ground stations.





Cessna 206 Stationair

If you have a load to haul, the beefy 206 gets it done. It's also good on floats and plenty stable for weather flying.

The Cessna 206 Stationair is one of those airplanes that you can dress up with a classy paint scheme and a stylish leather interior to fly business associates in style. Or, put one on floats and jump in with a wet swimsuit. Got stuff to haul? Load as much as you can fit through the big cargo door. Indeed, any vintage of the Stationair can wear a lot of hats.

Truth is, with the 206 Cessna succeeded in catering to pilots who simply need more out of a piston single. More room, more useful load, more seats, more fuel. And it doesn't just work for private operators. Part 135 companies might be drawn to it as a small freighter that is rugged, economical and can get in and out of remote airstrips while carrying a big payload.

Designing such an airplane is a challenge because optimizing for speed hurts payload; a large comfortable cabin may mean stodgy performance and no baggage capability. Rumor has it that trying to find an optimum compromise between speed, payload, range and comfort has driven

more than one aeronautical engineer around the bend. Many airplanes that have been advertised as "do it all" machines just aren't.

But the poster-child exception is an airplane such as the Cessna 206, which carries the SUV/minivan/pick-

saw fit to bring back to the land of the living when it restarted piston production. As a result and in addition to a wide range of \$60,000 mid-1960s and later airframes on the market, Textron will sell you a brand-new one for north of \$800,000.

Full-fuel payloads of 1000 pounds or better are not at all uncommon.

up concept to a capable conclusion.

It's not fast, nor is it really that slow, but it is stable, rugged, reliable, has six real seats and is remarkable for being able to carry a half-ton or so after the tanks are filled. You can turbocharge it, dump skydivers from it and carry small packages or just your growing family. It has proven tough and reliable enough to be a fixture in the bush throughout the world, holding on even as turbines shoulder out piston power.

So popular has been the 206's combination of simplicity and load-carrying that it's one of three singles Cessna

HISTORY

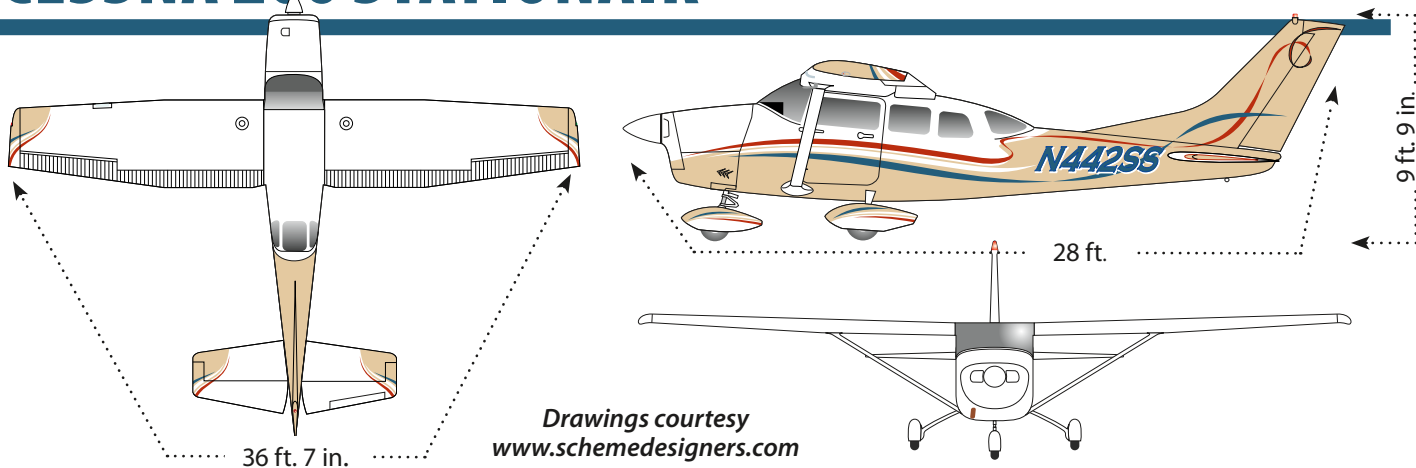
Cessna's biggest fixed-gear piston single is really three models, though all are essentially the same airframe. It was originally introduced in 1963 as the 205, a fixed-gear

210, technically known as the 210-5. It had two doors up front and a relatively small rear door on the left side. The engine was a 260-HP Continental IO-470. This airplane was a fixed-gear version of the recently revamped 210; it was produced for two years, with 577 delivered.

In 1964, Cessna responded to demand for more utility and created the U206 (U for "utility") Super Sky-

The turbo Stationair in the lead photo is retrofitted with the TKS ice protection system.

CESSNA 206 STATIONAIR

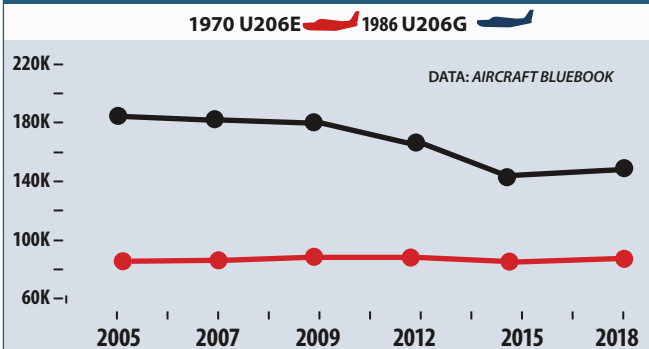


Drawings courtesy www.schemedesigners.com

CESSNA 206 SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1965 U206 SUPER SKYWAGON	CONTINENTAL IO-520-A	1700	\$30,000	65	1540 LBS	144 KTS	±\$65,000
1965 P206 SUPER SKYLANE	CONTINENTAL IO-520-A	1700	\$30,000	65	1510 LBS	143 KTS	±\$61,000
1970 P206D SUPER SKYLANE	CONTINENTAL IO-520-A	1700	\$30,000	65	1480 LBS	142 KTS	±\$68,000
1980 U206G II STATIONAIR	CONTINENTAL IO-520-F	1700	\$30,000	92	1598 LBS	147 KTS	±\$120,000
1980 TU206G II TURBO STATIONAIR	CONTINENTAL TSIO-520-M	1600	\$40,000	92	1534 LBS	152 KTS	±\$150,000
1986 U206G II STATIONAIR	CONTINENTAL IO-520-F	1700	\$30,000	92	1598 LBS	147 KTS	±\$160,000
1986 TU206G II TURBO STATIONAIR	CONTINENTAL TSIO-520-M	1600	\$40,000	92	1534 LBS	152 KTS	±\$165,000
2004 206H STATIONAIR	LYCOMING IO-540-AC1A	2000	\$45,000	92	1249 LBS	142 KTS	±\$230,000
2004 T206H TURBO STATIONAIR	LYCOMING TIO-540-AJ1I	2000	\$52,000	92	1249 LBS	150 KTS	±\$260,000
2009-15 206H STATIONAIR	LYCOMING IO-540-AC1A	2000	\$45,000	92	1249 LBS	142 KTS	±\$450,000

CESSNA 206 RESALE VALUE

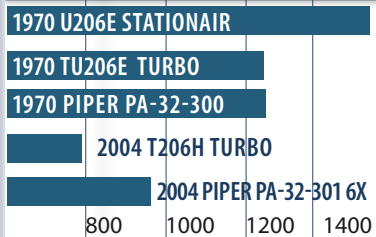


SELECT RECENT ADS

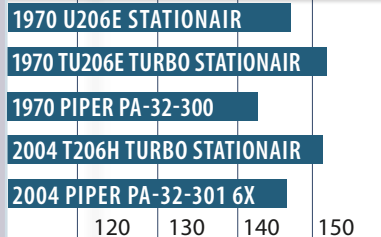
- AD 2011-10-09 SEAT RAILS AND ROLLER HOUSING INSPECTION
- AD 2008-05-09 ONE-TIME SEAT BASE/BACK ATTACH BRACKETS MODIFICATION (206H)
- AD 84-10-01 INSTALL QUICKDRAINS; REPETITIVELY INSPECT FUEL TANK FILLER AREA
- AD 79-08-03 DISCONNECT CIGAR LIGHTER OR INSTALL CIRCUIT PROTECTION

SELECT LATE-MODEL COMPARISONS

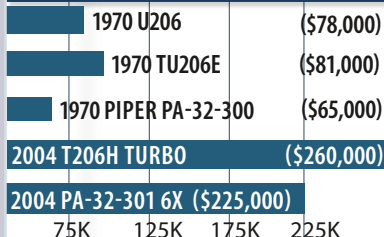
PAYLOAD/FULL FUEL



CRUISE SPEEDS



PRICE COMPARISONS





Like the other Cessna singles, newer Stationairs sport Garmin's G1000, top. That's an early 2000s steam gauge model retrofitted with Avidyne avionics, middle, and an earlier one with a mix of vintage avionics, bottom.



wagon, with a 285-HP Continental IO-520-A, redesigned wing and bigger flaps. Intended as a flying pickup truck, even the seats were optional. There was one door for the pilot and a big double door aft on the right side. The next model year saw the 205

more popular of the two. In 1967, the U model got a takeoff-weight boost and a new engine, the 300-HP Continental IO-520-F, while the P model kept the 285-HP IO-520-A. Turbocharging became available on both variants in 1966, with a

become the P206 Super Skylane, with "P" representing "personal" or "passenger," depending on with whom you're speaking. The P206 had the same door arrangement as the 205, but with the bigger engine from the 206. The U206 was by far the

285-HP Continental TSIO-520-C. The P206 was discontinued in 1970, with a total production run of 647. The remaining U206 and TU206 were offered with either a utility or passenger interior, and renamed Stationair.

A stretch of the fuselage brought into being the 207 Skywagon in 1969, powered by the 300-HP IO-520-F. One more seat was added, bringing the number available to seven. Useful load went up by about 30 pounds. An additional bonus was a nose baggage compartment, easing the task of getting the CG in the proper place during loading. The turbo model of the 207 was powered by a TSIO-520-G, also with 300 HP.

Camber-lift wings, which feature a slightly cuffed leading edge, were added in 1972. These improved low-speed handling at almost no cost to cruise speeds. At the same time, the baggage compartment got a 7-inch stretch. An aerodynamic cleanup in 1975 boosted cruise speed by about 6 MPH. The cleanup included more-streamlined wheel pants and improved cowl flaps.

In 1977, the horsepower of the turbo engine was upped to 310 (for takeoff only) on both the TU206 and the T207. A wet-wing fuel system was introduced in 1979.

In 1980, another seat was added to the back row of the 207, making it an eight-place airplane. This created the Stationair 8, but the Cessna designer remained model 207. The world would have to wait for the Caravan to see a model 208 and what may be the ultimate evolution of the high-wing, strut-braced single. The 207 was discontinued in 1984, and the 206 two years later. It was a great run.

Along the way, 206s saw several suffixes added, starting with the 206A in 1966 and culminating, temporarily, with the 206G in 1986. More than 7000, by serial number, U206s had entered the market, along with 647 P206s, the 577 aforementioned 205s

Removable cargo doors provide easy access to the rear seats, top photo, and make loading cargo a snap, bottom photo.

and another 788 207s.

But then a funny thing happened: In the mid-1990s, Cessna started making piston-powered airplanes again. After starting up assembly lines for the 172 and 182, the model 206 returned in 1998 as the 206H, powered not by a Continental IO-520 but by a 300-HP Lycoming IO-540-AC1A. It was joined by the T206H, powered by a 310-HP Lycoming TIO-540-AJ1A. Cessna recently stopped production of the normally aspirated 206 but has kept going with the T206H and is selling them for well north of \$600,000. Unlike the Continental-powered 206s, the H model is available with a five-place, club-seating option.

MARKETPLACE

Enormous fixed-gear singles aren't all that common in the marketplace. In terms of mainstream aircraft, the choices are pretty much limited to the Cessnas and Piper PA-32 Cherokee Six/Saratoga. Prices are comparable, and which makes the better choice depends in part on your needs. The big Pipers have a wing spar running through the cabin right behind the front seats, disrupting the loading area somewhat, and the Cessna is definitely the airplane of choice for floats. Both companies' products have proven reasonably reliable over the years.

The Pipers do have an edge in TBO over the Continental-powered 206s. While the best one can hope for from the Continental-powered Stationairs is a 1700-hour TBO, the Lycoming-engined 206s have TBOs of 2000 hours.

The -540-series Lycomings bolted on the Pipers have a TBO of 1800 hours (for the TIO-540-S1AD), and as much as 2000 hours in the case of the IO-540-K1G5 on the Saratoga and the Cherokee Six.

LOADING

This is the name of the game for Stationair pilots. While no airplane can handle anything you can fit in it, the Stationair comes closer than most. Full-fuel payloads of 1000 pounds or better are not at all uncommon.



The big rear cargo doors—creating an opening more than 44 inches wide—make getting bulky cargoes inside less of a chore than in other aircraft. Another nice touch is the lack of a lip at the doors, so cargoes don't have to be maneuvered up and over to get them inside.

The airplane can be flown with the cargo doors off which, combined with solid low-speed handling, makes it popular with aerial photographers and public benefit flying organizations involved in conservation research and monitoring. Public benefit flying organizations LightHawk and CAVU have owned multiple 206s, using them in remote areas.

Specialty kits were made available so the Stationair could take on such jobs as glider towing, parachute jumping and even aerial hearse service. There also is a cargo pod available. When using a cargo pod, make sure you follow any limitations on flap deflection that are on the STC for the installation.

With or without the cargo pod, the Stationairs offer ample loading flexibility. The allowable CG range is unusually long, making cargo/passenger positioning less of a juggling act than with many aircraft. However, despite some pilots' assertions that "If you can get it in, you can take off," weight and balance computations are



not optional. Several accidents over the years show it is possible to load a Stationair outside its envelope.

COMFORT

While the Stationairs have large cabins, they're not long on comfort with a full load of passengers. Noise levels, particularly during takeoff and climb, can be fairly high as piston-engined singles go. And the rearmost seats—row three in the 206, rows three and four in the 207—leave little in the way of legroom.

Another comfort consideration is the baggage compartment. In spite of Cessna's best efforts, it doesn't quite match the capabilities of the passenger compartment. As a result, passengers may find themselves sharing space with their bags.

PERFORMANCE

Top cruise speeds will run in the 145-knot area while burning 17 gallons per hour or more. Throttling back to a

CESSNA 206 ACCIDENTS: OTHER

From what we've observed, most Cessna 206s work for a living. That was supported by our review of the 100 most recent accidents of the marque—and a substantial proportion of those were an indication that the airplanes involved lived in rugged conditions and had been often run hard and put away wet.

Eighteen percent of the events involved engine power losses or stoppages, usually because of improperly conducted maintenance or failure to perform it. Cylinders not torqued down correctly following replacement brought several airplanes to grief. A fire resulted when a turbocharger overboard exhaust pipe separated—the owner had declined to perform the service bulletin issued calling for inspection and maintenance to prevent that specific risk. We've seen enough reports of inflight fires due to the challenging environment in which the exhaust systems of turbocharged airplanes live to strongly recommend regular and careful attention to their condition.

We were not surprised that the frequency of runway loss of control (RLOC) accidents was relatively low—20 percent—because the airplane has effective controls and good manners on the ground. However, a 206 is not easy to land well and changes personality dramatically with different loadings.

With the CG forward, it takes dedication and determination to get the nose up into landing attitude. Light, the airplane will float a surprisingly long way if the pilot has tacked on any extra speed on final. That may have played a role in the five overshot landing events.

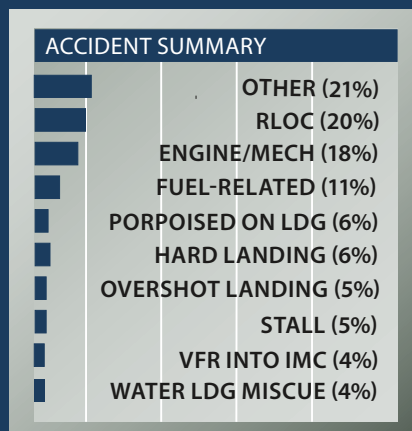
Loaded and slow, a Stationair can develop a sink rate approximating a dropped sewer cover. It has the power to recover, but it has to be applied. Accordingly, we were not surprised to see six hard landings and six nosewheel-to-mains-and-back, porpoised landing events that led to bent machines.

A 206 has poor visibility over the nose in landing attitude. A reluctance of pilots to get the nose up into the needed landing attitude may play a part in landing-related accidents. The nose blocking the view ahead definitely played a role in a crash following a bounced water landing and go-around. The pilot flew into a row of trees blocked by the nose during climbout.

Stalls accounted for only five accidents, and they were on short final (one) or shortly after takeoff. One was from a slush-covered runway from which the pilot managed to pry the overloaded 206 but then stalled it trying to avoid obstacles.

We've been around the block enough to know that 206s are routinely overloaded—sometimes to an eye-watering degree—but it won't carry everything you can shove in the doors. One stall-after-takeoff crash involved an airplane that was some 800 pounds over gross.

Stationair accidents played prominently in our "We'll always have Alaska" file. One beach landing where the pilot "hit a little hard, but not too hard" resulted in the right gear separating at the axle, followed by left gear collapse. Hitting driftwood with the tail on a beach takeoff first jammed the elevator full nose-up and, after pilot input, full nose-down. Further input was unsuccessful and the airplane hit the beach nose-down. The pilot was unhurt.



leisurely 135 knots cuts gas consumption to a more reasonable 13 GPH. Operating LOP can reduce those numbers two to three GPH while keeping CHTs down—a consideration in hot climate operations.

Handling matches the aircraft's size. Pilots who enter the Stationair after climbing the Cessna model ladder may find the aircraft is just more of the same—only heavier, although the ailerons are notably responsive, even at slow speeds. Few owners seem to mind the fairly heavy controls: Snappy handling is not why they bought the airplane.

This is not without its benefits, though. It makes the Stationair an excellent IFR platform—stable and rock-solid. It also makes for a relatively smooth ride in turbulence.

Another benefit is that the Stationair is reluctant to stall. Pitch forces are fairly heavy to begin with. Compounding this is the generally nose-heavy loading of the airplane. Since the CG envelope is so long, and most everyone wants to sit up front, the CG is often at or near its forward limit. Also, with power on, the deck angle required for a wings-level stall is alarming. Put it all together and the Stationair is not generally a willing participant in stalls. If you do stall the airplane, the behavior is pure Cessna: There is a definite break and it will roll off if the ball is not centered. Recovery requires lowering the nose by at least relaxing back pressure. When heavy, especially with full flaps, it may take some altitude before you can establish a positive rate of climb.

A drawback of the forward CG tendency is a proclivity for inexperienced 206 pilots to arrive nose first during landing, especially at light weights. It takes a hefty pull on the yoke to flare properly. Thus, Stationairs are no strangers to hard, nose-first landings that sometimes damage the aircraft. In the 207, the nose baggage compartment can simply add to the nose heaviness. However, using less than full flaps for landing (say only 20 degrees) can ease the control forces required to flare. Also, as one reader aptly put it, "That is what trim was invented for: Use it."

When loaded toward the aft CG limit the equation changes significantly. It doesn't take nearly as much effort to flare to land. A pilot who isn't ready for the lighter control forces can

get surprised at how easy it is to get the nose up.

The 206 can feel like two different airplanes when it is light with a forward CG versus at gross weight and a mid- to aft-CG loading. We strongly recommend that any checkout in a 206 include time with the airplane loaded light and forward and heavy and aft. Part of that should be what it takes to get to the runway when heavy, with full flaps and slow. Be prepared to put the throttle to the stop.

Like most Cessna singles, the 206 does pretty well in short/soft/rough field operations, a big factor in the purchase decision for many of our respondents. Early models had 40 degrees of flap, which helped tremendously for short arrivals. However, the airplane just won't climb with that much aluminum hanging out in the breeze. Cessna later limited flap travel to 30 degrees.

MAINTENANCE

Simplicity is a good thing, and helps keep maintenance costs down. But on the other hand, Stationairs are working airplanes by and large, and wear and tear can easily turn the tide in the other direction.

We've seen problems with the tail, mostly corrosion caused by the foam-filled elevator and trim tab getting soaked with water and pulling off rivets, screws and nuts—a concern if the airplane was ever on floats.

Some of the brackets in the tail can crack. There have also been some instances of cracking door posts, though these problems have not proven to be a safety issue.

Given the number of respondents who routinely operate out of short and rough fields, combined with the nose-heavy landing tendency, we recommend paying close attention to the landing gear, brakes and the prop for erosion from the detritus on back-country strips.

There have been a couple of 206/207 specific ADs: 85-2-7 calls for inspection of a roll pin in the fuel selector, and 85-10-2 mandates recurrent inspection or modification of the induction air box.

Other ADs of note are 91-15-4 and 82-27-2, inspection of the prop; 97-26-17, ultrasonic inspection and possible replacement of the crankshaft; 96-12-22, recurrent inspection of the oil filter adapter; and 2011-10-09, seat

rails and roller housing inspection. The 206/207 is subject to the infamous 84-10-1 fuel tank bladder AD.

MODS, CLUBS

There's probably a modification available for the 206/207 to allow it to do most anything someone might want. This includes skis, floats, long-range tanks, STOL kits, vortex generators, cargo pods and various speed mods.

One can even opt for an STC'd 450-SHP Rolls-Royce turboprop engine, courtesy of Soloy (www.soloy.com). If that is too much, and the factory IO-520 isn't enough, maybe an IO-550 from Texas Skyways (www.txskyways.com) would be another solution.

Vitaoe Aviation in Circleville, Ohio, offers cross-flow cylinder and induction upgrades for IO-520 engines and an STC'd IO-550 upgrade. It also has a variety of engine mods for the 210 Centurion. Visit the company webpage at www.vitaoeaviation.com for performance specs.

CAV Ice Protection has the weeping wing TKS upgrade for 206 F, G and H models. Visit them at www.caviceprotection.com and read our full report on de-ice system upgrades in the February 2017 issue of *Aviation Consumer*.

As far as type clubs, there's the Cessna Pilots Association (www.cessna.org), which we're told is getting back up to speed. There's also the Cessna Flyer Association (www.cessnaflyer.org).

OWNER COMMENTS

I was involved with a skydiving group out of Iowa, and somehow we ended up owning a 206. For a group of jumpers who wanted a fun plane that worked its butt off every weekend it was hard to beat.

The airplane almost always went to the annual with no major maintenance issue. We stripped out the seats, except for the pilot's, and removed the door. And yes it was cold the times we flew in the winter.

For an instrument panel we had a VHF radio and a compass that worked. I think the fuel gauges were mostly working.

Since we just flew over the airport we just measured the gas with a stick. If it was wet, there was enough to get to 7,500 feet. Gravity always seemed to bring it back down pretty well. We rarely did cross-country flights (except for those trips to Mardi Gras, whoop),



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That's a Vitae 520 crossflow engine mod in the top photo. The TKS de-ice mod protects the struts, wings and elevator leading edges, middle photo. A 206 has plenty of authority on Wipaire amphibious floats, bottom.



Arizona. I've averaged putting about 70 hours a year on the airplane.

Insurance was initially over \$7000 a year as I was a 58-hour pilot. Once I got my instrument rating the rates went down to where I now pay \$2004 for a \$1M smooth policy. Average cost for five annuals has been \$1539. I've added some avionics and GAMI-jectors. In the time I've owned the airplane I've only had to replace the spinner, EGT probe, battery, a fuse and repair the beacon and the brakes.

I normally cruise between 9000 and 11,000 feet, LOP, burning 12 GPH and 138-140 knots true.

I purchased the airplane so the entire family could travel together. I looked at the 206, 210, Cherokee Six and the Lance/Saratoga retractable. I opted for the weight-carrying ability of the 206 and a non-retract because of my limited flying time, plus the high wing matters when dealing with the Arizona sun. I did not look at 206s with fuel bladders as I did not want to deal with their potential problems.

The ability to carry a great deal of weight is important to me because I prefer to fly with full fuel for safety, and can do so in the 206 and still have a big load in the cabin. It is slow, but I do not feel as if it ever gets ahead of me. It is a great instrument platform but it is also a lot of fun to just fly around for sightseeing or in the pattern shooting landings. I think the slow speed, especially at the stall, makes for safe touch and goes.

My best story came out of a sad event—my daughter was badly injured in a skiing accident, suffering numerous fractures. Driving to the airport for the trip home was agonizing for her. The 206 proved to be the best airplane ever. We used the big cargo door opening to easily get her into the fully reclined rear seat, strapped her in and stuffed pillows around her. She slept comfortably all the way home.

Richard Greisman
via email

takeoffs and landings, you could get good at bringing it in and stopping easily on the 700-foot strip.

The trick, if you can call it that, was understanding how to trim it when 1200 pounds of people and gear exited. If you trimmed it to fly neutral, you simply ran out of elevator when it came time to flare, and you ate up a lot of runway. If you kept the trim the same as when loaded all you had to do was put out full flaps, slow it down till the needle bobbed around 50 knots, and carry a little power. Once on short final, about 200 feet out, start flaring and cut the power as

you went over the cornfield fence. You had to really haul back to get a good flare, but if you did, it easily stopped in 300 to 400 feet.

John "Mac" McCarthy
via email

I bought my 1980 U206 in 2006 for \$185,000. It had a new interior and upgraded avionics. I bought it for personal use as there are six of us in our family, including my 6-foot-4-inch son. We live in Oklahoma and fly it to

so we weren't that concerned with efficient travel.

We could put in six jumpers and the pilot and get to 7500 feet and back down three times per tach hour. It was almost like the more we abused it, the more it loved us.

We had no mods on this wonderful plane, not counting removing the seats and doors, but it was a true STOL aircraft. The field we were based at had a 3000-foot main runway, north and south, and a 700-foot diagonal. Because all you did was

I have flown several 206s on floats, one on PKs, the rest on Edos. The Edos seemed to be a good design for the 206, almost always easy to get out of the water even when loaded; the 206 with PKs was a dog. My flights were in and out of lakes and rivers in Alaska and in salt- and fresh-water operations from Seattle north to the Inside Passage in British Columbia, Canada.

On floats, the 206 with the IO-520 engine required that the cowl flaps be open at all times to get appropriate cooling. The operator I flew for called for takeoffs at 25 inches and 2500 RPM, mostly to keep the noise level down.

Unless the airplane was heavily loaded, or the area was tight, the reduced-power takeoff was manageable. Heavy, full power was necessary, sometimes pressing against the five-minute limit, especially on glassy water.

An issue that came up regularly was carrying too much in the back end, either passengers or baggage. Even though the airplane was in CG, it could be a real challenge to get the floats up on the step on takeoff.

If you couldn't get on the step the CHTs would redline and the five-minute limit on full power would get hit and you'd have to go back and do something to change the loading.

The rule of thumb most of us used was that if the tails of the floats started to look even with the surface of the water before the pilot climbed on board, you were headed for a challenging takeoff. This is where the 206 on Edo floats mattered to me.

If I could get the airplane on the step, it would eventually come off the water, even if you had to lift one float at a time on glassy water. On PKs, getting on the step did not guarantee the airplane would come off the water; I might end up just high-speed taxiing.

The 206 flew well on floats with a good load, handled turbulence well but didn't seem to like flying too slowly on final approach as it would develop a very high sink rate. The pilots I flew with and I found that a power-on approach was the best for managing gusts and sink rate, with a little bit of power carried all the way to touchdown.

Greg Bedinger
via email

I purchased a new turbo 206 in early 2008, base the airplane in Denver and use it for business and personal travel around the western half of the U.S., often crossing the high mountain ranges of the West. When I was evaluating alternatives, I considered a variety of cabin-class twins and six-place singles. Ultimately, I decided to go with a new 206, which provided a platform for gaining experience flying with a glass cockpit and would give me decades of reliable service, hopefully following me into retirement.

Some of the add-ons to the airplane were extended range/tip fuel tanks, gap seals, active traffic (TAS) and XM weather. The extended fuel tanks provide an interesting combination of higher useful load (1420 pounds), increased range with nearly 120 gallons of fuel on board, higher cruise speed and lower stall speeds. I don't usually fly with fuel in the tip tanks, except for very long trips. The full-flap, power-off stall speed has dropped to an unbelievable 35 knots when lightly loaded.

The TIO-540 engine seems to be happy at 18 gallons per hour at maximum cruise at nearly all altitudes giving speeds from 160 knots at 12,000 feet to 170 knots at 18,000 feet.

As an instrument platform, the airplane is exceptionally stable in every weather condition that I've encountered—no sick passengers, yet. It took some effort to become proficient with the G1000, but it was worth every minute. Landings are predictable and smooth, even in the high crosswind conditions.

So, obviously, I'm pretty high on the 206. It provides a great combination of huge loads, reasonable speeds, crazy endurance and good maintenance costs that are common to Cessna products.

Mike Henderson
Denver, Colorado

After logging over 400 hours in my TU206G since 2014, I have come to believe a turbocharged 206 is the ultimate piston-powered aerial SUV for the owner-operator based in the western United States. It can haul heavy loads from short airstrips at high density altitudes, while still providing good cross-country performance and the ability to cruise in the mid-teens.

I moved up to the turbo 206 after

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USED CESSNA 206

(continued from page 31)

500 hours in Cessna 180/185s and find that it outperforms the SkyWagon from short strips above a certain payload and density altitude combination, while enjoying a much larger, more comfortable and easier to load cabin.

The 206 is a stable and predictable handling aircraft and makes for an excellent IFR platform. Mine is equipped with an Aspen PFD, Garmin GNS530W and S-TEC autopilot and is routinely flown single-pilot IFR. I have been as high as 18,000 feet to top weather, but 12,000 to 14,000 feet is the sweet spot, balancing terrain and performance to oxygen needs.

Despite initial climb performance of over 1000 FPM, cruise climbs require 100 to 105 KIAS at 30 inches/2500 RPM/24 GPH to keep the hottest CHT under 400F during the

If you need even more space for hauling stuff, you can hang a cargo pod on the belly of a 206, shown below.



warmer seasons, dropping average cruise climb rates to 700 FPM.

With 8.50 main tires and no wheel pants, my 206 cruises at 125 to 140 KTAS burning 13.5 GPH LOP at altitudes from 4000 to 14,000 feet. It will go a bit faster consuming 17 to 18 GPH at 75 percent power ROP. The range drops considerably and CHTs are difficult to keep under 380F during the summer at high power settings.

My average GPS groundspeed is 125 knots over a variety of distances/altitudes/times of year using 13.5 GPH LOP in cruise.

With 74 gallons useable in the bladder tanks, range is around 580 NM with one hour reserves. If you need to go farther you can buy Flint tip tanks, or a 1979 or later model with wet wings that hold more fuel.

Relative to its size and capability, the 206 has been cost-effective to own and operate. Annuals are similar to other six-cylinder Cessnas and I figure \$1 per NM for direct operating costs for fuel and engine reserves. Reading up on current engine management theory and best practices will certainly help owners keep their cost down.

I consider the G model to be the ideal 206 due to its combination of gradual improvements and creature comforts compared to earlier models, while still having the smooth and efficient Continental engine and a 200-pound lower

FEEDBACK WANTED

CIRRUS SR22



It's time for a fresh look at the used Cirrus SR22 market in an upcoming Used Aircraft Guide in *Aviation Consumer*. We want to know what it's like to own these go-places singles, how much they cost to operate, maintain and insure and what they're like to fly. If you'd like your Cirrus SR22 to appear in the magazine, send us any photographs (full-size, high-resolution please) you'd like to share to the email below. We welcome information on mods, operating expenses or any other comments that can be helpful for buyers considering a Cirrus SR22. Send correspondence by June 1, 2018, to:

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empty weight advantage compared to the current H models.

Of course the 206 is not the only option for a six-seat piston that can still operate from unpaved runways. A turbo Cessna 210 would be a better choice for those who need more XC performance. A Bonanza 36 would be very tempting east of the Rockies given its low altitude speed and graceful lines.

For the widest cabin possible there is the Piper Six/Saratoga series. However, none of them can operate from the airstrips where the 206 does its best work.

Mathew Hanson
Spokane, Washington