November 2015
Volume LXXIX
Number 11

The consumer resource for pilots and aircraft owners

The Aviation Consumer®

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The Aviation Consumer

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AVIATION CONSUMER (ISSN #0147-9911) is published monthly by Belvoir Aviation Group LLC, an affiliate of Belvoir Media Group, 535 Connecticut Avenue, Norwalk, CT 06854-1713. Robert Englander, Chairman and CEO; Timothy H. Cole, Executive Vice President, Editorial Director; Philip L. Penny, Chief Operating Officer; Greg King, Executive Vice President, Marketing Director; Ron Goldberg, Chief Financial Officer; Tom Canfield, Vice President, Circulation.

Periodicals postage paid at Norwalk, CT, and at additional mailing offices. Revenue Canada GST Account #128044658. Subscriptions: $84 annually. Bulk rate subscriptions for organizations are available.

Postmaster: Send address corrections to AVIATION CONSUMER, P.O. Box 8535, Big Sandy, TX 75755-8535. In Canada, P.O. Box 39 Norwich, ON NOJ1PO, Canada. Publishing Agreement Number #40016479

G1000: SLOW AND STEADY TO THE FINISH LINE

As we often do with products and companies—partly for our own cynical amusement—my colleague Paul Bertorelli and I were recently feeding off one another and poking holes in Garmin's hugely successful G1000 integrated avionics. In case you haven't been counting, the system turned 10 years old last year. In avionics life, that's a geriatric zone, which was partly the nature of our chiding.

Then, a letter from a G1000 owner appeared in my inbox. Frustrated that his new airplane still doesn't have an ADS-B Out solution, he said Garmin hit the G1000 snooze button because frankly, what incentive does it have to replace it when it owns the OEM avionics market? But as we report in the Avidyne upgrade article on page 4 of this issue, Avidybne's full product line—including the R9 and now certified slide-in replacements for the fleet of Garmin GNS530W and GNS430W navigators—positions Avidyne to make a run at the market Garmin has owned for years.

At first blush, the surface of the scalable G1000 doesn't look much different now than it did when it first appeared in Diamond's DA40 back in June 2004, followed by numerous rapid-fire OEM applications—too many for my fuzzy memory to count. For a history lesson on what Garmin has done to advance the G1000 over the last 10 years, I reached out to Garmin's senior business development manager Bill Stone.

In short order, the steady-talking Stone set me and the record straight that Garmin has deliberately put the G1000 on a slow and steady tempo of maturity, while pointing out that the system continues to serve just as it was intended: a weight-saving, high-tech, integrated glass cockpit to rescue a market long stuck in the age of steam gauges. Its weight-saving characteristics make it even more desirable for the light jet and turboprop markets. Still, I wonder what the G1000 might look like today if it had more competition. A touchscreen, perhaps? More retrofit potential?

It was around the launch of the GNS430 (1998) that the G1000 started coming together and remnants of the GNS430 live in the G1000 feature set today. As for the notion that Garmin is ignoring the G1000 to focus on grander products to serve the higher-end jet market, including the G3000 and G5000 integrated suites (likely the future face of the G1000), Stone said Garmin makes it a point to incorporate at least one new major function or capability to the G1000 each year, while hinting there is something big in the works. As for big G1000 milestones, there were plenty, all leveraged from the original computing platform that's at least as old as the Internet.

In 2005, Garmin added the GFC700 integrated autopilot, initially certified on the Beech Bonanza and eventually to all platforms. A year later, the system got weather radar and TAWS-B terrain alerting, electronic charts/SafeTaxi and WAAS GPS. In 2007 the Cirrus-specific Perspective version arrived, followed by synthetic vision and a 1090ES extended squitter ADS-B transponder in 2008. TCAS and TAS active traffic alerting came in 2011, followed by major rotorcraft interfaces in 2012. Georeferenced electronics charts, VNAV capability and a maintenance datalogging computer came in 2013. Garmin is now finalizing the GDL88 ADS-B and Flight Stream wireless interface. Stone reiterated that WAAS G1000s have TSO for mandate-approved ADS-B Out (and that the G1000 always had a Mode S transponder), but it's a joint effort between OEMs and Garmin to add the ADS-B capability to the aircraft type certificate.

Perhaps Bertorelli and I were a little tough on Garmin's aging G1000, but I still think the market is ready to embrace the next-gen glass cockpit. While Garmin isn't a company that announces a new product before its time, you can bet it's long been powered up at Garmin's metropolis.—*Larry Anglisano*

LONG LIVE THE BARON

Great report on used Beech Barons in your October 2015 issue. I recently met up with a friend to fly some old Baron 58s (which were used as freight dogs) to a salvage yard to be parted out. The 58 Baron my friend flew had 20,899 hours on the airframe, a current annual inspection and it flew great. The one I flew was young—with 14,390 hours on the airframe. This is proof of just how durable these airframes are. Compared to a model 55 "baby Baron," the 58 Baron handles more like a bomber.

I found some of the owner comments in your article interesting. For example, I was surprised to see one owner with high twin-engine time paying $4000 per year for insurance. My insurance premium is $2600, but perhaps I have mine valued lower. I also pay $437 per month for unheated hangar space at Wheeler Downtown Airport in Kansas City, Missouri.

Carl Carlson
via email

Insurance premiums can vary based on initial and recurrent training, hull value (as you pointed out) and pilot experience. As for hangar rent, that's all over the board, too, depending on location and availability.

ANR HEADSET SHOOTOUT

Thanks for a great publication and the ANR headset shootout article in the October 2015 issue of *Aviation Consumer.* But I have to correct you on the price of the Harman AKG100 model.

As of November 2014, we reduced the price to $999, but still retained the features you pointed out in your article.

Additionally, AKG has started producing light filter kits, which will change the built-in white LED map light to either red or green for better night performance. Current AV100 headset owners can contact AKG at 813-909-9491 for a complimentary set, while our supplies last.

Heath Lawson
AKG Aviation

Being a gadget freak, I think I've purchased every noise-cancelling headset on the market over the years. As you concluded in your recent review, I consistently favor the Bose A20 for its ANR performance. I haven't upgraded to the new down-cable for the new Bluetooth features, but your article convinced me to give it a try. Thanks for all you do.

Bud Harrison
via email

OIL CONSUMPTION

I am planning to purchase a 2003 Cessna 182 with an engine that has 700 hours of total time. The seller represents that the engine only burns one quart of oil in 15 to 20 hours. I have owned three airplanes and always added oil after 5 to 10 hours of operation. Just what is considered normal oil consumption?

James C. Thompson
via email

That's a tough question to answer because it really varies from engine to engine, even of identical models. While it's not impossible to operate it 20 hours without having to top off the oil, your experience seems to represent the norm.

We asked owners who operate the normally aspirated Lycoming IO-540 in the early Cessna 182S and 182T models and most reported typical oil consumption of one quart every 8 to 10 hours.

Despite the encouraging claims, be sure to do a thorough prebuy inspection with a maintenance facility that's neutral in the sale. This should also include an oil analysis.

ADS-B SNAGS

One issue I have with ADS-B is compatibility. For example, there is the Trig TT31, BendixKing 74 and Avidyne AXP340 1090ES ADS-B transponders. I have a Garmin GNS430W in my 1973 Cessna 150L. However, my 150 is an Aerobat model, with an "A" in front of the 150 and a different serial number than what is covered in the AML.

The King KT74 has my A150L on the STC AML, yet the Trig TT31 only has non-aerobatic 150s. I confirmed this with my avionics shop. Plus, the Avidyne transponder costs too much for me to even consider.

Additionally, the STCs for these units cover the Garmin GNS 430W/530W series. Will the GTN 600/700 series ever make the STC? It's a minefield even avionics shops can't always give answers for. I would like a Mode S transponder integrated with my 430W, but an all-in-one unit like the Stratus ESG may be a better choice to replace my Narco AT50A, due to compatibility issues alone.

Tim Boese
via email

We're hearing that ADS-B field approvals are fair game, something your shop might inquire about with its FSDO. In our view, if the unit is approved for plain-vanilla 150s, it might be easy to gain approval for your aerobat, especially if the unit has approval in other aerobatic models. Or, wait for the Stratus.

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Avidyne Upgrades: Competitive, Maturing

Armed with a modern and capable product line, Avidyne is gaining traction in a market dominated by Garmin. Price and try both before committing.

by Larry Anglisano

For most of the past decade, we had all but given up on serious competition for Garmin in the full-panel upgrade market. Once-dominant BendixKing faded and Garmin dealt with UPS-AT by simply buying it. But now, somewhat quietly, comes Avidyne with a full line of products to make a head-to-head run at Garmin.

With the IFD-series navigators certified, shipping and into their second generation of software, dealers report both a spike in interest in full-panel Avidyne suites and simpler upgrades to Garmin's vast installed base of GNS430W/530W navigators. That's ignited a lively resale market for used GNS navigators at a time when the refurb market is running hot.

After a drawn-out certification process for the IFD line, Avidyne appears fully up to speed, it has improved its support effort and the company is likely finding sales among buyers who want something new that's not made by Garmin.

In this article we'll outline those core products and the technology Avidyne is positioning to compete with Garmin so you'll be better prepared to solicit quotes for each brand, even if a shop is preprogrammed to offer a Garmin solution.

MILESTONES, STUMBLES

Perhaps lending to its persistence and longevity, Avidyne's presence dates nearly as far as Garmin's. It pioneered retrofit multi-function display technology when it showed its first MFD product at Oshkosh in 1995 and certified it in 1997. With scanned georeferenced approach charts, followed by ship weather radar overlay (which ran on the Windows NT operating system), the FlightMax MFD kicked off the electronic chart frenzy.

Garmin's GNS430 arrived in 1998, followed by the GNS530 in 1999—one-upping Avidyne—since these all-in-one navigators (technically not MFDs) could also overlay traffic, sferics data and mapping. But the retrofit MFD rivalry began in 2000 when Garmin bought UPS-AT and the existing MX20 MFD, which later morphed into the current GMX200. Still, it was Avidyne's Cirrus-focused EX5000 Entegra big-screen MFD and accompanying PFD in 2003 that put Avidyne in the OEM pole position (mainly Cirrus, Piper and Columbia)—a spot it ultimately lost to Garmin's G1000 around 2004.

But some of Avidyne's current retrofit product line stems from technology it used in OEM applications. As an example, it certified the first satellite Broadcast weather system—the HeadsUp Technologies XMD76 XM satellite receiver—which debuted in the Cirrus and then trickled to the aftermarket. Avidyne later had success with its own MLB700 Sirius receiver. It competes with Garmin's GDL69 SiriusXM system. Avidyne's TWX670 real-time lightning detector competes with the L-3 Stormscope, although Avidyne admits that it's

Drop-in stack upgrades for early Cirrus models, left photo, isn't Avidyne's only focus. A certified retrofit autopilot, a full line of traffic and ADS-B products, plus an in-development retrofit PFD shows Avidyne's strength.

CHECKLIST

- More competition is just what the avionics retrofit market ordered.
- But it also demands top-shelf owner and dealer support. So far, Avidyne is doing well.
- Missing from Avidyne's interface is a major tablet app interface—an area Garmin is expanding.

a slow seller in the U.S., stifled by satellite datalink and ADS-B.

It was the early R2 Entegra glass cockpit that ultimately birthed Avidyne's latest IFD540 and IFD440 retrofit navigators. The non-touch-screen R9, which came out in 2009 as a follow-on product to the final R8 series Entegra 5000 dissed by the OEMs, was (and still is) intended for aftermarket retrofit. Although not in huge numbers, it has been retrofitted in Cirrus and Piper models. With a installed price north of $80,000, we think trade-ups to preowned Cirrus models with Garmin G1000 Perspective avionics generally win out over R9 upgrades. Still, the R9 gives Avidyne bragging rights to a retrofit glass cockpit for more applications than Garmin's G1000—a player only for retrofit in some King Air models.

Purchase an IFD540 and IFD440 navigator (designed as a plug-in replacement for Garmin's GNS530W and GNS430W) and you'll get the same GPS, navcomm, FMS and base software that exists in the R9 integrated suite. Avidyne admits that some of the delay in bringing the IFD to market stemmed from the challenge of shrinking the R9's big-screen data to a format appropriate for a stack-mounted retrofit screen.

In the end, think of the trickle-down IFD systems as R10. That's because Avidyne started the IFD540 with software version 10, essentially a follow-on improvement to the R9. What isn't included on the retrofit products is the R9's ADAHRS. Expect to see that, or something similar, in Avidyne's planned PFD4000 retrofit primary flight display. Although unveiled a few years ago, Avidyne said it put the project on a slow boil while it concentrated on certifying the wider-reaching IFD products.

Speaking of retrofit PFDs, Avidyne partnered with Aspen Avionics when it certified the DFC90 autopilot interface (more on that in a minute). Worth mentioning is the IFD540 and IFD440 navigators have complete functionality with the Aspen Evolution PFD, Garmin G500 and G600 retrofit PFD, in addition to Garmin's GI-106A and the Mid-Continent Instrument and Avionics MD200-series standalone OBS indicators.

FEDERATED UPGRADES

As complete as the product line may be, Avidyne doesn't build all of the retrofit avionics aimed at federated radio stack upgrades. PS Engineering (based on its PM8000) builds the AMX240 Bluetooth-equipped audio control panel, but with a bezel that matches the IFD navigators and Avidyne's AXP340 1090ES ADS-B transponder, built by Trig Avionics.

Avidyne integrated wireless Bluetooth and Wi-Fi receivers in the IFD navigators. It uses the Bluetooth to interface its remote keyboard, middle photo, for streamlined data entry. The IFD440 in the Piper stack, bottom, replaced an existing Garmin GNS430W in less than 10 minutes, thanks to plug-and-play compatibility.

Keeping with the slide-and-fly upgrade potential, the AXP340 is designed to slide into an existing King KT76A transponder installation, but shops still need to wire in GPS data from the IFD WAAS navigator.

As for full-up ADS-B, Avidyne's product line isn't as capable as Garmin. For now, the 1090ES transponder serves as ADS-B Out, while the NavWorx-built MLB100 receives ADS-B weather and traffic on 978 UAT. The MLB200-series (available with and without internal WAAS GPS) has 978 UAT ADS-B In and Out, but aren't available yet. This gives Garmin the clear advantage when it comes to ADS-B solutions. Aside from the panel display-compatible GDL88, Garmin's GDL84 is purposed for display on a tablet.

Building on the traffic alerting technology it acquired when it bought Ryan International in 2005, the TAS600-series active traffic processor recently evolved into the TAS-A combination TAS and ADS-B traffic receiver. Ultimately competing with Garmin's GTS800-series combination TAS/ADS-B traffic processors, Avidyne's VeriTAS system blends interrogated active and passive ADS-B traffic and correlates the targets based on threat. The system has been certified and Avidyne says the

Aside from the IFD navigators, Avidyne is leveraging its market growth with two major retrofit products. The DFC90 autopilot, top, is compatible with most Cobham/S-TEC autopilot servos and wiring. It has STCs for some Beech Bonanza, Cessna 182 and Cirrus models. The TAS-A VeriTAS ADS-B with TAS active traffic processor, left, receives both ADS-B and active traffic targets. Existing plain-vanilla TAS-600 systems are upgradable and should be available in a few months.

software will be available early next year, along with the MLB200 ADS-B transceivers.

ADVANCING THE IFD, DFC

Since flying with an early version 10.0 software-equipped IFD540 for review in the March 2015 issue of *Aviation Consumer,* Avidyne released the major software upgrade 10.1, which also brought the certification of its $15,995 IFD440 hybrid navigator (an answer to Garmin's GTN650). The new software addresses many of the nits we had with version 10.0.

Some notable improvements in version 10.1 include standby comm frequency monitoring (which will require additional audio wiring and a hardware mod to the navigator), the Bluetooth keyboard interface, airspace aural alert warnings, full support for ADS-B weather from the MLB100 receiver, a headwind component label within the air data calculator, plus capability to fly both LP+V approach types and allows advisory glideslope (+V) to work even when the system has no air data input. Avidyne is reserving the internal Wi-Fi function for future upgrades.

Unlike the GTN650, the IFD440 can drop into a Garmin GNS430W installation with little to no wiring changes and seriously widens Avidyne's market reach. Until now, the only modern replacement navigator with this footprint is Garmin's touchscreen GTN650, which requires installation, but it costs less.

During a recent visit to Avidyne's Lincoln, Massachusetts, headquarters we watched an IFD440 drop-in installation and software configuration. In well under 10 minutes, Avidyne's Tom Harper removed a GNS430W from a Piper Arrow's radio stack, slid in an IFD440, set up the install configuration settings and paired its new Bluetooth keyboard.

Garmin doesn't have a certified retrofit autopilot, but Avidyne does. Approved for retrofit in Cirrus, Beech Bonanza and Cessna 182 applications, Avidyne's DFC90 flight control system drops into existing S-TEC autopilot installations and uses the existing servos and much of the existing wiring harnesses.

Since the DFC90 is AHRS-based, it requires either Aspen's Evolution Pro PFD or Avidyne's Entegra PFD. In general, the DFC90 upgrade is $10,000, not including a couple days of installation. Avidyne says it's working with the Cessna Cardinal Flyers group to potentially expand the STC to Cessna 177-series models.

WARRANTY AND APPS

Buyers still take issue with Avidyne's controversial Aeroplan extended warranty plan, which indemnifies Avidyne after any crash that drags Avidyne into a lawsuit. Avidyne's Harper matter-of-factly noted it isn't backing off on the policy, but also clarified that buyers don't have to buy the extended coverage and indemnify Avidyne to get a warranty.

Avidyne recently extended the warranty to two years if you register the new quipment on myavidyne.com. This registration process better enables Avidyne to notify owners of product enhancements. Additionally, if owners buy an Aeroplan policy, they'll get an additional two years of coverage, for a total of four.

The other concern is app compatibility. As we go to press, the IFD540/440 navigators don't integrate with popular apps like ForeFlight, WingX and FlyQ—a limiting factor for some buyers that might want the same capabilities as Garmin's Flight Stream wireless cockpit.

As we've been reporting, the big news out of Garmin is Flight Stream's new compatibility with the ForeFlight Mobil app (in addition to Garmin's own Pilot tablet app for iPad and Android.) This enables a two-way, wireless connection between ForeFlight and Garmin's GTN-series navigators.

Avidyne noted that any future wireless interface between a tablet and its Bluetooth and Wi-Fi-equipped IFD navigators will have a cost and installation advantage over Garmin's Flight Stream. Garmin's wireless interface requires a dedicated Bluetooth hub (Flight Stream model 110 or the flagship 210) for wiring into the GTN navigators. This could easily add another $1000.

AVIDYNE VS GARMIN NUMBERS CRUNTCH

TOTAL: $39,830

TOTAL: $34,590

The list prices above include mounting racks and hardware kits for new installations (deduct $650 from each Avidyne IFD navigator for Garmin GNS slide-in replacement and $250 from the AXP340 transponder when replacing a King KT76A.) The pricing for the GTN750 includes FliteCharts electronic charting (Jeppesen charts are $1995 extra.) Avidyne's IFD540 includes the Jeppesen charts, while the smaller IFD440 and Garmin GTN650 don't have electronic charting. For ADS-B In, Avidyne's MLB-100 978 UAT receiver is $2495 and Garmin's base GDL88 (which also has ADS-B Out) is $3995. For Garmin wireless capability, add approximately $1000 for the Flight Stream module. Both Garmin and Avidyne have options for remote versions of their transponders. Given the additional panel height required for Garmin's GTN750, it offers a space-saving remote audio panel, which is controlled directly on the GTN750 screen. Bottom line? There are many variables that will affect the installed price, even for slide-in installations, but Garmin has a price advantage in a side-by-side, box-for-box comparison.

This past summer, Avidyne announced a two-tier industry standard software development kit (SDK), which is available to app developers wanting access to Avidyne's data stream to write new apps.

"We're not going to restrict people when it comes to working with our data output to create new apps," said Avidyne's Harper. Of course, tier-two developers (these are big-name players) will need to work with Avidyne for a more complete I/O interface. This is in the works, but Avidyne wouldn't give us details.

HOW YOU MIGHT CHOOSE

For existing GNS530W/430W owners on the fence, we think upgrading to a slide-in IFD is worth a try, expecially with Avidyne's generous try-and-fly money-back guarantee. It will refund your money and pay the dealer up to four hours to reinstall your Garmin navigator if you aren't satisfied after flying with it for 30 days.

Avidyne said trade-in values for fully functional and clean Garmin GNS530Ws can be as high as $7500 and $5500 for GNS430Ws. It also said it can broker units for dealers not wanting to stock them.

For new, teardown installs, our advice is to find a dealer that has both brands on hand for a demonstration. Larger shops actually have them installed in demonstration aircraft. Additionally, download the IFD and GTN simulators, and while you're doing that, get a comparable and firm quote for both brands after the shop inspects the aircraft.

In our view, Avidyne's aggressive run at the retrofit market has wide-reaching benefits for the dealer network and Garmin, too. It stimulates product growth, while also keeping prices competitive (Garmin has already announced a rebate program.) But Avidyne will need to prove it can do what Garmin does superbly well—which is service the dealer network and excel at sales volume. Both will take time, because Avidyne has a lot of catching up to do.

Contact www.avidyne.com, 800-284-3963.

Tecnam P2010: Skyhawk Contender

We like the airplane's sleek good looks, comfort and handling solidity. While it's faster than the Skyhawk, it burns more fuel and could use more climb rate.

by Paul Bertorelli

If imitation really is the sincerest form of flattery, the Skyhawk should be flattered indeed by the likes of the Italian manufacturer, Tecnam. Last summer, Tecnam began marketing its P2010 Lycoming-powered single in the U.S., having gained a sales foothold in Europe.

Tecnam's P2010, a training and personal airplane contender, is certified in Europe and soon will be in the U.S.

It's not quite accurate to call the P2010 a Skyhawk knockoff because it's a substantially different airplane. But it follows the same idea: 180-HP four-banger; four seats; modest payload, albeit with a slightly faster cruise speed.

And Tecnam is making a bit of run at Cessna, although the company is aiming more at the personally flown aircraft market rather than the institutional training segment that Cessna essentially owns. In Europe, where Tecnam has placed 30 P2010s, it's just the reverse.

We recently visited Tecnam's North American sales headquarters in Sebring, Florida and spent half a day with the airplane. Tecnam is currently touring its demonstrator around the country.

WORLD MARKET

Although Tecnam isn't a household name among U.S. pilots, it is in fact a major world producer of light aircraft. The company's U.S. sales director, Shannon Yeager, told us the Capua, Italy-based Tecnam is delivering about 40 airplanes a month, across seven models that include

CHECKLIST

- Compared to the rakish P2010, the 172 looks absolutely dowdy.
- Interior is spare but stylish. Third cabin door makes for easy ingress/egress.
- The P2010 is a solid 125- to 130-knot airplane, albeit at higher fuel burn than a 172.
- The Skyhawk has a better climb rate and burns less gas for equivalent speed.

four LSAs, two Part 23 aircraft and one military-spec twin for surveillance work. Even as the P2010 comes to the U.S., Tecnam is developing an 11-passenger piston twin for the commuter market. (See sidebar.)

The P2010—as its numerical designation suggests—has been in the works for five years and has full EASA certification for Europe. Although the FAA cert is supposed to be a rubber-stamp bilateral, as we go to press, Tecnam was still working on final details for the aircraft and was hoping to have a type certificate in hand by mid-October.

It appears to us that the P2010 will compete in an already crowded market, against the Cessna 172SP and Diamond's DA40, both gasoline and diesel versions. It's generally comparable in price to the Skyhawk—about $400,000, typically equipped—but is $60,000 cheaper than the Diamond DA40. (Against the Skyhawk, the P2010 would have a constant-speed prop at that price. But the Skyhawk would have SiriusXM datalink at the same price.)

If the Cirrus SR20 is tossed into the mix, the P2010 lands between the $359,000 base-price SR20 and the $517,000 GTS. Fully equipped, Piper's comparable Archer LX is also around the $400,000 mark. We're not sure how price sensitive this market is, but there's not much daylight between these invoice numbers. A new single has simply escalated to the point that $400,000 is the current entry level.

HYBRID BUILD

While Tecnam isn't the only company building both composite and metal airplanes, it may have been doing so for longer than anyone else. The P2010 can be thought of as a hybrid construction airplane. The fuselage and some trim parts are carbon fiber with the fuse being built in two halves, joined and cooked in an autoclave. The airplane's wings and horizontal stabilator are of conventional metal construction. As is usual for composites coming out of Europe, the fit and finish on the airplane appear to be flawless.

The landing gear is spring-steel leaf type, joined to the fuselage in two pieces in a robust box under the cabin. Like everything else these days, the nosegear is castering and joins the rest of the structure at the bottom of the engine mount. Although it doesn't have a conventional oleo strut, the P2010 does have a shock absorber on the nosegear to soak up bumps and protect the firewall from hard landings.

The wing-mounted fuel tanks are aluminum cells within the wing bays, with fuel lines running from the tanks through the A-pillars into the engine compartment. A single valve on the console controls left/right and off; there's no both. For its class, the P2010 carries a lot of fuel: 62 gallons total, all but one gallon of it usable. That gives the airplane quite a bit of range and payload flexibility.

The P2010's control surfaces are conventional riveted aluminum, albeit plumbed a little differently than other aircraft. Cables are used to a central control box under the cabin floor and from there, a combination of cables and tubes are routed to the ailerons, rudder and the stabilator.

For pitch trim, the airplane has both manual and electric control of an anti-servo tab on the stabilator. Unusually, it has electric rudder trim, too, and it turns out that it needs it.

The P2010 has its share of nice details. The IO-360 is easily accessible through a pair of clamshell cowl doors, right. A gas spring keeps them from flopping closed or getting caught in gusts. Passenger seats have their own ventilation and dimmable reading lamps, lower photo.

TV P2010 VIDEO

AVweb
www.avweb.com

WEIGHT, PAYLOAD, ERGOS

At a distance, the P2010 looks smaller than the Skyhawk it purports to compete against. It's not entirely an illusion. It's about a foot shorter than the 172 with a wingspan more than three feet shorter. It also appears to sit lower on its gear, so the engine compartment—which has a nice clamshell access door with gas springs—is easier to access.

TECNAM'S NEW PISTON TWIN

While both Diamond and Tecnam have introduced light twins during the past decade, the market hasn't seen a new large-displacement, piston cabin-class twin since the early 1970s. But demand for such a thing isn't quite dead, apparently.

In 2012, Cape Air, a famed New England-based commuter airline with a fleet of aging Cessna 402s, approached Tecnam to spec a new 11-passenger short-haul aircraft.

As a result, the P2012 Traveler is well along in development and expected to fly as early as next year, for delivery in 2017. Tecnam's Shannon Yeager says the all-metal aircraft is being readied for fuselage destructive testing and a conforming prototype will follow.

The aircraft will be the first commercial entry to use Lycoming's new TEO-540, better known as the IE2 engine we've been reporting on for several years. The engine has advanced electronic controls, including a FADEC and single-lever operation. Yeager says Tecnam believes its direct fuel costs will be about 30 percent less than that for the 83 Continental-powered 402s Cape Air now operates. Unlike the 402s, which were also designed for the commuter role, the 2012 will have fixed gear.

While no official commitment on orders has been announced yet, Cape Air did pay Tecnam to develop the Traveler idea, so it's fair to assume intent to buy exists and Cape Air may not be the only customer. No prices have been announced, but we're told the Traveler will likely sell for under $1.5 million.

Cape Air has been a fixture in New England, successfully flying scheduled service from Boston and other cities to Cape Cod and the islands. It also operates in Montana, Missouri, Kentucky, Illinois and in Micronesia and the Virgin Islands.

Weightwise, the P2010 is almost a carbon copy of the Skyhawk, which we suspect is both by intent and governed by the laws of physics and aerodynamics. The P2010's gross weight is 2552 pounds, on an empty weight of 1643 pounds for the example we flew. That yields a useful load of 909 pounds, just a few pounds less than the standard Skyhawk.

With full fuel—372 pounds—the P2010 has 537 pounds left, or three people and some overnight bags. Down fuel it by 25 gallons and you can just carry the imaginary four people and have two hours of endurance to near dry tanks at a mid-power setting. Again, that's standard Skyhawk stuff.

What isn't standard Skyhawk is how you get that stuff into the backseat and baggage compartment. That's because the P2010 has a third passenger access door on the right side behind the co-pilot's entry door. It's large enough to shove big objects into the rear seats or for passengers to slip into the back. All things being equal, that door might give Tecnam a slight edge in selling against the 172 or the Archer. Diamond's DA40, of course, has the large rear access hatch.

The P2010's rear seats are comfortable with good but not generous legroom once the forward seats are adjusted. The forward seats slide on tracks and can be elevated with a small lever on the right side of the seat bottom. They also recline. The doors have jamb latches and a safety latch on the top, similar to Piper's products. The baggage compartment—capacity 88 pounds—is accessed through a hatch on the right side or from inside the airplane by removing a fabric cover that doubles as a hatrack.

Yeager describes the interior as "an automotive experience" and we would agree. Although it's spare in the way European cars tend to be, it's comfortable and adequately roomy. A center console extending aft even has cup holders and there are individual reading lights and vents on the overhead. The panel is consumed by a G1000 suite, which is standard with the airplane, with the GFC700 autopilot as a $30,000 option. Yeager told us European models can be equipped with the Garmin G500 and that option might be available for U.S. aircraft as well. Despite the looming ADS-B deadline, Garmin still doesn't have an integrated solution for the G1000, so for ADS-B Out compliance, the P2010 has a GTX 330ES transponder. A GDL88 is an add-on option for ADS-B In.

For backup, Tecnam uses the Mid-Continent Instruments SAM, mounted vertically between the PFD and the MFD. Electricals are controlled by large, clearly labeled rockers on the lower panel and—a nice touch—they are backlighted for night operations. Breakers, again, clearly labeled, occupy the far right panel and are easy to get to. The only things we found difficult to access were the parking brake lock, which is a long reach to a knob near the floor on the center console, and the alternate air knob by the pilot's right knee. The throttle is a T-handle on the center quadrant.

FLYING IT

We give Tecnam's Yeager props for being the most honest sales person we've encountered recently. Before takeoff, he warned us that the airplane would be slow to get off the runway and slow in initial climb. It was. To be fair, the airplane we flew was equipped with a fixed-pitch cruise prop, which is just one option. It can also have a fixed climb prop or a constant-speed model—all MTs—and we would highly recommend the latter. With the cruise prop, the engine just doesn't seem to make sufficient static RPM.

The ground roll is leisurely—the POH says 2053 feet over a 50-foot obstacle on a standard day with no wind. Once at rotation speed, which Yeager recommended as about 55 knots, a little steady back pressure does it, not a distinct rotational tug. The sight picture is low compared to other airplanes of this class. The airplane is not a brisk climber—500 to 600 FPM. It might do better on a cooler day—we had 85 degrees F—but worse in high density altitude. A climb prop would help, too.

The P2010's forte is stability, which it has in abundance. It holds a trimmed airspeed with a will, requiring little pilot input even in a climb. In trimmed cruise, disturbing the pitch provokes a phugoid that damps almost completely in two cycles, suggesting that the airplane will be a standout for instrument training and instrument flight.

Control forces are on the heavy side, with rudder being the lightest and roll the heaviest. Surprisingly, the airplane requires almost as much rudder input as a taildragger does and it takes attention to get a coordinated turn. There's no rudder/aileron interconnect and it takes tweaking the rudder trim to keep the ball centered.

Initial flap deployment causes quite a bit of pitch up, but the second notch is less noticeable. This is comparable to a Skyhawk, we would say. So are the stalls; it takes work to get one to break, but they will if provoked. But the nose hardly falls through before the airplane is flying again.

With the cruise prop, we set up the airplane for a typical low-altitude cruise value of 125 knots, which required 12 GPH leaned to 50 degrees rich of peak. The P2010 will cruise faster, up to about 136 knots, says the POH. But it will take some gas to do it; 15.6 GPH, according the POH.

And it's at this juncture where economy-minded buyers will wish to put a sharp pencil on the performance pages of the POH. For instance, at 116 knots on a standard day, the P2010 POH calls for 11.9 GPH against the Skyhawk's 9.9 GPH at 119 knots. That's 9.7 NMPG for the P2010 versus 12 NMPG. This is not a trivial difference. Over the course of an engine TBO run, it's 4000 gallons of gas or more than $20,000 in the U.S. To be sure, the P2010 is faster than the Skyhawk, but the operator will pay for that in more fuel burned.

We also noticed that CHTs in cruise were on the high side. The lowest we saw was 400 degrees F, the highest about 450. We were given data from a longer flight done in the U.K. and while the temps were lower, cylinder 1 was still above 400 degrees. While Lycoming's limit is 500 degrees, we prefer max temps in the 380-degree range, in the name of cylinder durability. We would like to see some tweaking of the baffling or cowling to bring those numbers down.

Approaches are flown power off at about 75 knots, from an 85-knot pattern entry speed. Crossing the numbers at 70 knots, Yeager advised flying into a flat flare and landing with the mains, but with the nosewheel just off the pavement.

A no-drama landing seems easy enough, partly because the P2010 is so stable and the controls heavy enough to preclude over-controlling. It's one of the most trim-stable airplanes we've ever encountered and students should find it easy—and safe—to land.

CONCLUSION

Who will buy this airplane? Yeager is honest about it; in the U.S., it probably will not be flight schools for the short term. Cessna, if it stays in the market, is a strong player there primarily because it's a known quantity and big schools are biased toward product support and dispatch reliability.

A reasonably equipped P2010 will invoice similarly to the 172, so a buyer looking at both won't have much price Delta to work with. The P2010 carries about what the 172 does, but cruises a little faster, albeit at the expense of more fuel. We would give it the edge in cockpit appointments and amenities and its sleek good looks make the Skyhawk look a little dated. But it's the third door that really sets it apart from the competition. That alone might ring up some sales for Tecnam.

If we had our druthers, we would like to see some re-propping for better climb performance. For normal density altitude, it's adequate, but in the desert or intermountain west, it could be marginal. Perhaps turbocharging or an upgraded engine could address that. And we wouldn't mind some tweaking of the cowling or baffling to nudge the CHTs down. We simply don't agree with Lycoming that 400-plus degrees is okay. High CHTs aren't a good thing for cylinder longevity and OEMs ought not to accept them, in our view.

Garmin's G1000 is standard equipment in the P2010, top. Front seats elevate and recline and access to the rear cabin is through a third door. CHTs tend toward the high side, suggesting baffling needs tweaking.

Continental's ECi Buy: Will It Spike Prices?

Continental Motors' recent acquisition of ECi could bring new products, but for the short term, there are fewer choices.

by Larry Anglisano

Continental Motors got the attention of engine shops and owners last spring when it bought Danbury Aerospace, a manufacturing group that includes San Antonio, Texas-based Engine Components International, or ECi.

The acquisition was Continental's third and caused a stir because it resulted in fewer choices and price competition in cylinders and components for Continental engines.

But Continental says the acquisition of Danbury's assets (finalized this past summer) will bring plenty of new opportunities for a wide stretch of the market. This includes growth for ECi's Titan engine line for experimental and LSA applications, added support for Continental and Lycoming engine overhauls, plus more momentum for its own line of engines and parts.

OEMs and engine shops seem to shrug off the recent acquisition, but based on our discussions with end users, in addition to feedback obtained from our recent cylinder satisfaction survey, it isn't exactly being welcomed with open arms, but instead with guarded wallets.

A GROWING FAMILY

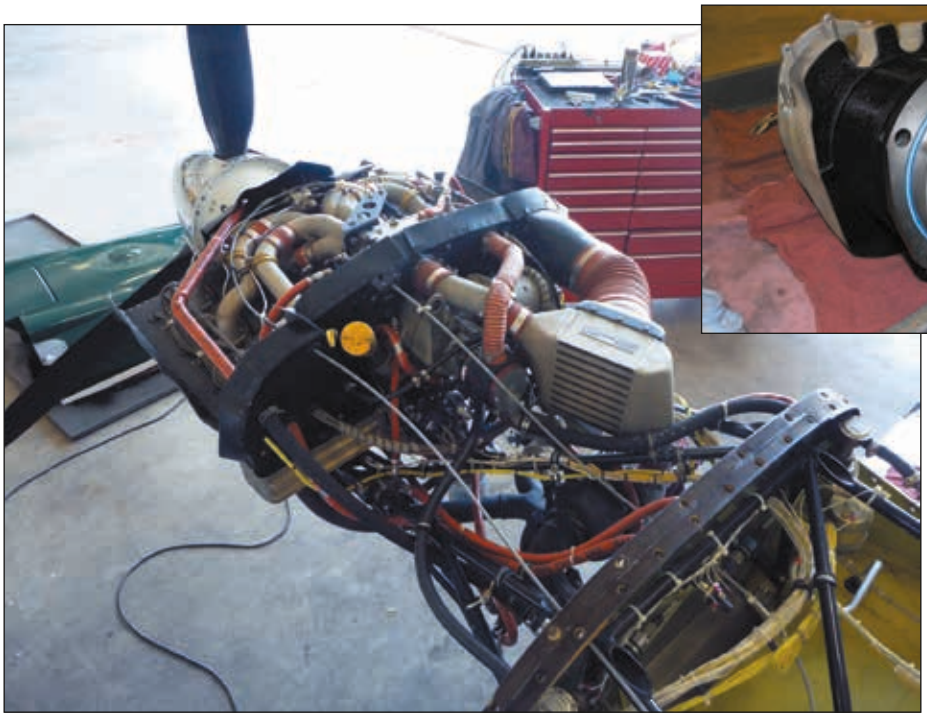
The logistics of acquiring a busy operation like ECi's doesn't come without at least some immediate consequence to the end user. We were alerted to more than one sizable wrinkle in the ECi acquisition when reader Roger Freedman dealt with work stoppage on the rebuilding of his Continental IO-360-ES crankcase. His local shop sent it to ECi's San Antonio, Texas, location earlier this summer. After the case sat untouched for several weeks, Freedman said his shop was advised that ECi would no longer be performing case work on Continental engines and the component would have to be shipped elsewhere for the work.

What's up with that? If Continental bought the assets of ECi, then why in the world couldn't the newly purchased operation support a major component from one of its own engines, which happened to come off a Cirrus? Freedman told us DivCo, Inc.—the shop in Tulsa, Oklahoma, that ultimately repaired the case—is swamped with work that might have been accomplished by ECi.

Worth mentioning is that DivCo specializes in crankcase and sump repair for both Continental and Lycoming models and has been in business for over 30 years. It reeled in favorable comments in our last engine shop survey.

Continental's Emmanuel Davidson said in a statement to *Aviation Consumer* that Freedman was simply unfortunate to be caught in the period of the ECi sale closing and resulting temporary work hiatus while Continental regroups and restructures the ECi operation.

"We have worked closely with our new team members to assess how to integrate the ECi business, operations and products into the operations of Continental Motors Group," he told us.



It's a narrowing market for cylinders like the ones on this Continental turbo engine, left. In our recent cylinder survey, 18 percent of the respondents have aftermarket Superior cylinders, inset, while 26 percent have ECi cylinders, now owned by Continental Motors.

With ECi under Continental's wing for a few months now (it acquired the assets and working intellectual property), while also hiring some (but not all) of the employees that used to work for ECi and Danbury, Continental said some of the product manufacturing and services offered by ECi will continue at the San Antonio, Texas, location. This is the manufacturing of PMA Lycoming parts to include cylinders, crankcases, crankshafts and pistons, to name a few. It also includes the Titan engine for the experimental and kit market. Additionally, Continental acquired the FAA repair station that Danbury used to operate, plus the Continental line of PMA parts. The Repair Station that tags along with ECi's assets could be a sizable shot in the arm for Continental's Fairhope, Alabama, facility—an already growing MRO that Continental has invested heavily in.

Consider that Continental overhauls both Lycoming and Continental engines in this facility, while also providing airframe and engine maintenance, in addition to avionics work.

As for the future of the ECi brand as the industry knows it, Continental told us that since it plans to eliminate some of the existing ECi product line, the long-established ECi brand will eventually go away. ECi has been an aftermarket supplier of aircraft piston engine parts since 1943, originally supplying jugs to U.S. armed forces during World War 2.

GOT NICKEL?

ECi, under the Titan brand name, is known for having the most complete line of replacement PMA cylinders for Continental and Lycoming engines. Additionally, ECi had an in-house cylinder overhaul program where cylinders were sent out with the proprietary Nickel+Carbide surface treatment. The idea here—which most shops we spoke with seem to agree with—is Nickel+Carbide cylinders could be the better choice for engines that don't see regular use because the treatment provides a more corrosion-resistant surface than stock nitrading.

Part of the uproar surrounding the ECi acquisition is whether Continental will abandon ECi's Nickel cylinders. Continental's Davidson told us it will not abandon Nickel+Carbide treatment. As we go to press, pricing hasn't been finalized, but Davidson said the company will offer the Nickel+Carbide coating process as an option on its existing line of factory cylinders for both Lycoming and Continental engines.

With Continental Motors being a provider of its own replacement cylinders, the ECi buyout means an even narrower aftermarket cylinder market. But, look at the bright side. A benefit to acquiring ECi's physical assets is Continental's ability to offer ECi's Nickel+Carbide processing, bottom photo, as an option for its own cylinders.

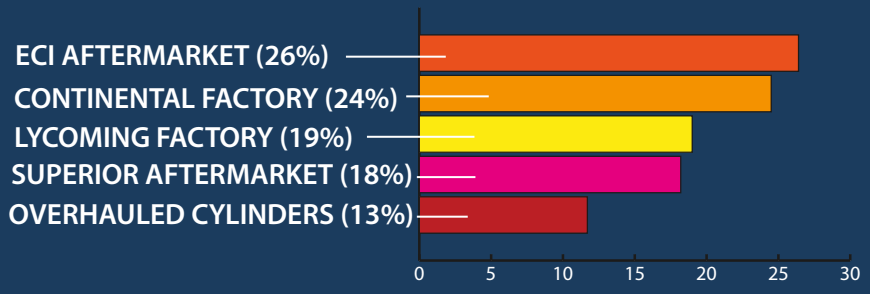
While reassuring for those sold on the Nickel+Carbide cylinder treatment, including major engine rebuilders like Waco, Texas-based RAM Aircraft (ECi's major customer), fears of increased pricing loom. RAM provides engine overhauls, performance upgrades, new propellers and new and PMA-new parts for a wide variety of makes and models, specializing in twin Cessna models.

RAM—which deals heavily with Continental IO-520 and IO-550 rebuilds—has been an outspoken opponent of Continental's acquisition of the Danbury family of businesses.

"In the simplest form, this comes down to the economics of supply and demand. There were only three sources for new cylinders for Continental engines, including Continental's own factory cylinders, Millenium cylinders from Superior and ECi. It's a narrow market and when you take one of the supply sources out, a constant demand will likely drive prices up," said Thomas Dunn, RAM's director of marketing.

It's important to note that in a market faced with increasing prices for factory replacement parts, aftermarket companies like ECi invested sizable cost and effort to produce its

CYLINDER POPULATION: ECi DOMINANT



The results of our September 2015 cylinder survey on sister publication AVweb.com yielded just shy of 380 responses. As the graph at the top reveals, ECi aftermarket cylinders dominated the survey in popularity, but not by much compared to the number of Continental factory cylinders. But as the data on page 16 reveals, ECi cylinders led Continental factory cylinder in owner satisfaction by a sizable margin. In our estimation, that's not exactly good news should Continental pull the plug on ECi cylinders. On the other hand, Continental could use ECi's cylinder technology as an innovative avenue for upping the game of its own cylinders. If prices goes up, you can bet buyers will demand it, or open their wallets to aftermarket competitor Superior.

own PMA replacement parts, providing decent amounts of competition and quality parts at more reasonable prices. This isn't an easy task in a certification environment still bogged down with regulatory red tape.

On the other hand, reputable engine overhaulers—including RAM Aircraft—use parts from a variety of suppliers, including Continental factory parts. In our estimation, this means if you're concerned that ECi's buyout will create a void in the availability of quality parts, don't fret. There are other suppliers and we suspect to see companies like RAM step up its effort to produce more of its own PMA'd parts, which is exactly what RAM is doing. While it might be a while before RAM can (or will) ever offer its own cylinders, in the absence of its Nickel line it is currently building its engines using a mix of Continental steel cylinders and Superior Millenium cylinders.

"Despite the ECi buyout, we're plugging along without issues because we've never had all of our eggs in one basket. Our slogan has always been to use the best engine parts, no matter the manufacturer," RAM's Dunn told us.

RAM is among a growing number of suppliers with FAA ODA capability, or organization designation authorization. An ODA enables a company's own engineering department to act as an extension of the FAA, with the ability to oversee its own product certification process. Ultimately, this can reduce the time it takes to bring a new product to market, while reducing costs.

RAM's Nickel cylinders have long been a mix of Continental and ECi cylinders treated with Nickel+Carbide. For now, it's using Superior and Continental steel cylinders.

SHOPS, OEM'S NEUTRAL

An ECi product that Continental said it won't abandon is the Titan X-series engines. These are non-certified clone engines built and delivered (fully assembled) around Lycoming's architecture, to include the X320/340/360/370/540-series, and built by ECi using all factory-new parts (the F-series are Titan factory remanufactured engines).

The Titan line has leverage in both the LSA and experimental market. For instance, the 180-HP Titan X O-320 engine was a joint effort between ECi and CubCrafters (which funded much of the original development work) for its Carbon Cub LSA.

CubCrafter's John Whitish told us the company has delivered well over 300 of the Titan X340-series engine in existing Carbon Cub kits. When asked what the ECi acquisition means for CubCrafters—Titan's largest OEM—moving forward, Whitish expressed some uncertainty, but was positive.

"Honestly, we don't know. We've met with Continental's management several times and remain optimistic that its experience and resources should bode well for the Titan engine and for future development between companies," Whitish said.

Whitish also noted that ECi's product support got better and better over the years, meaning Continental will need to step up to maintain solid commitment to the sizable experimental/kit and limited, but maturing LSA market.

Vickers Aircraft recently selected the Titan IO-340CC for its Wave amphibian LSA, in development. Vicker, in part, credited Continental's financial stability for the decision.

We spoke with a handful of engine and airframe repair shops, most of which took Continental's latest buy in stride. Interestingly, when it comes to cylinders, some shops avoid the aftermarket entirely after dealing with one too many cylinder ADs.

Eric Santerre, the director of maintenance at VIP Aircraft Maintenance in Hartford, Connecticut, swaps his

share of cylinders and maintains a loyalty to Continental and Lycoming.

"It's a customer decision, but we don't suggest any cylinder other than what's offered by the engine manufacturer. Whether it's a Continental or Lycoming, we give the customer easy options: we'll either send the cylinder out for repair or we'll buy new Continental or Lycoming cylinders. Sticking with the brand that made the engine has worked well for us," Santerre said.

"I'll be sorry to see ECi's Nickel+Carbide cylinders go away should Continental not adopt the process. I maintain some airplanes that don't see more than 10 hours of operation per year. Those cylinders are good for combating rust. But I do worry about rising prices as yet another competitor goes away," said Allen Goldman, an A&P in the northeast.

"In previous years we've installed aftermarket cylinders only to pull them off months later when an AD comes out. While the manufacturer may pay for replacement parts, it's the customer that could pay big money for the replacement labor or early inspection effort (referring to FAA ADs issued against Titan cylinders)," said VIP's Santerre.

MORE PAY TO PLAY

It's too early in the game to predict precisely what impact Continental's acquisition of ECi will be to the market after removing a major competitor over a range of products. As we explain in the cylinder survey summary on page 16, many buyers are convinced that prices will be on the rise—a logical prediction.

On the other hand, like other businesses facing trouble, we wonder if ECi's demise was inevitable. There have been rumors that ECi was facing financial issues due to slowing sales, higher costs and a down economy.

But without seeing its financials and its exact profit margins, we can't confirm if its business model (which included a long-standing and sizable relationship with RAM Aircraft and CubCrafters) was sustainable or not. At this point, it just doesn't matter.

What does matter is how Continental will structure its own product line, the acquired ECi product line and the decisions customers will make when faced with buying a Continental product.

With the ECi purchase, Continental picks up the non-certified Titan X-series engine line for experimental and LSA applications. That's the 180-HP 340CC engine used on the Carbon Cub SS, pictured here.

In a recent interview with *Aviation Consumer,* Continental Motors' Rhett Ross was forthcoming, while recognizing there still is at least some competition.

"Yes, Continental is becoming proactive and prices have risen closer to a factory price model because one of the sources of supply (meaning ECi) is out of the market," he said.

Ross reiterated there still remains competitor Superior, while companies like Kelly Aerospace and Hartzell are involved in their own PMA process to ensure there is a competitive spirit in the market.

While cautious not to badmouth any competitor involved in an alternative PMA parts manufacturing program, Ross pointed out that many PMA programs are built around an incomplete product cost structure.

In other words, it's the OEM that makes up the difference by carrying the costs of new product design and product liability, while also picking up slack when it comes to product innovation.

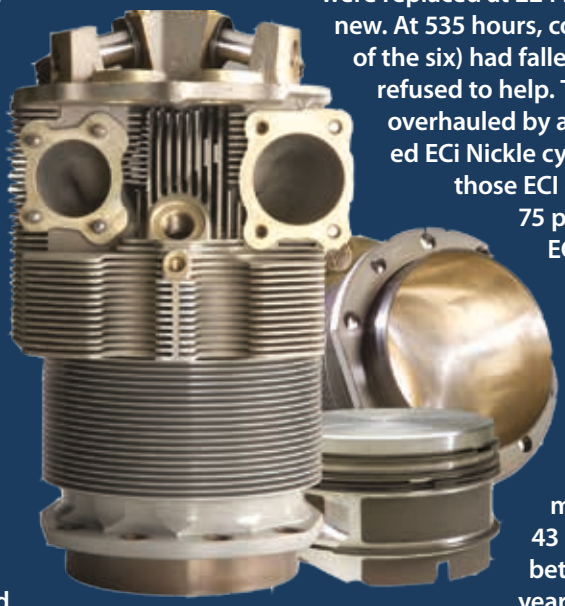
It's clear to us that Continental won't retain some—if not many—of the existing ECi products, but some acquired products will get a new lease on a better life. This includes the experimental Titan engine line and more products for both Continental and Lycoming applications.

The way we see it, if ECi was in financial straights as speculated, its acquisition by a financially stable and competing Continental Motors should hardly come as a surprise. For aircraft owners, it's yet another cost hike in a declining market.

CYLINDER SURVEY: LYCOMING, SUPERIOR TOPS

Our latest cylinder survey yielded similar results as it did when we ran it in 2012. Again, Lycoming factory cylinders rated impressively well with our respondents—60 percent said they were happy, while another 28 percent were satisfied with them.

When it comes to selecting cylinders, the survey revealed that 25 percent of buyers rely on the advice of their maintenance shop—a trend shift we recognized several years ago. As noted earlier, that trend is for shops to recommend factory cylinders, rather than aftermarket offerings to a large degree, based on our discussions with shops. But 25 percent of our respondents buy cylinders on reputation, 23 percent buy on perceived durability and 20 percent stick with what is already on the engine. Interestingly, less than 9 percent base the buying decision on the cylinders' price.



But a mechanic's recommendation isn't always a sure thing, as was the case with Mark Brody after his mechanic recommended a set of ECi jugs. "I went through eight years in court fighting ECi because my cylinders were faulty (the plasma-coated rings delaminated and caused damage). I ultimately won the case, but it still cost me over $100,000," Brody wrote.

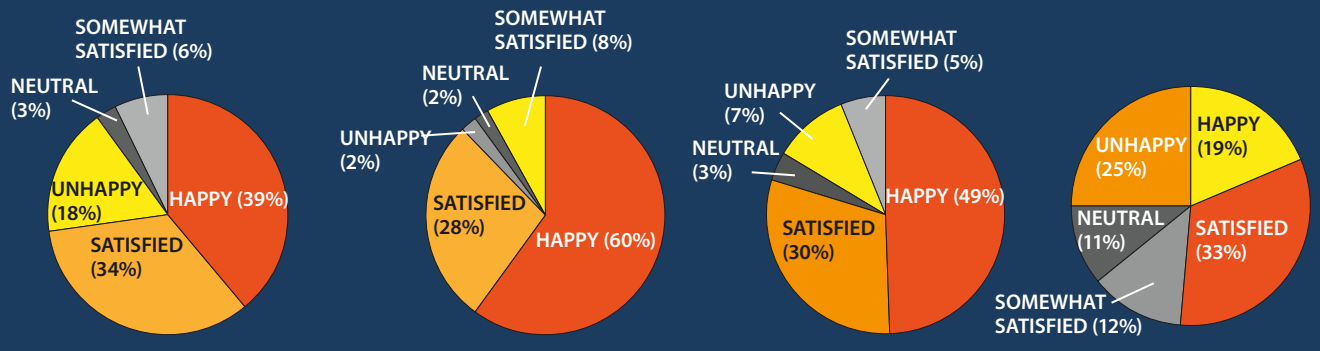
For those with years of bum luck with Continental jugs, some owners—including Russell Kelly—remain optimistic that Continental will improve its quality under new ownership. "I've had a long and unsatisfactory association with Continental cylinders with a turbo (TSIO-360LB1) engine. Over 26 years I have found many brand new cylinders were well out of tolerance and unacceptable when new out of the box. In this age of computer milling it is hard to imagine why the tolerances are so bad. Hopefully the quality will improve now the company is owned by the Chinese," Kelly remarked. A whopping 25 percent of the folks who took our survey said they were unhappy with their Continental cylinders, and 13 percent were only somewhat satisfied. It's a double whammy for unhappy Continental cylinder owners like Jeffrey Guy ready to make the switch to ECi. "I have a Baron that is Part 135. My right engine was factory new six years ago. The cylinders were replaced at 224 hours with six more factory new. At 535 hours, compression on most (four out of the six) had fallen below 40/80. Continental refused to help. The left engine was field overhauled by a local A&P who recommended ECi Nickle cylinders. Now at 447 hours, those ECI cylinders remain in the 65 to 75 psi range. I would have had ECi nickle these Continental cylinders, but now ECi is gone," he told us.

If Continental picks up ECi's Nickel+Carbide process, there's a sizable market of infrequent flyers with engines that might benefit. In the survey, 43 percent only fly the aircraft between 50 and 100 hours per year and 15 percent fly less than 15 hours in a year.

The good news is Superior—the remaining aftermarket cylinder manufacturer—did well in our survey. Almost 50 percent of owners were happy and another 30 percent were satisfied. This topped ECi and clobbered Continental.

Superior cylinder owner Hal Beers summarized what could be a bright future for Continental's competitor. "I don't see how this merger could mean anything but more expensive cylinders and less customer support from Continental. Superior should see this as a real opportunity," he said in the survey. It's now up to Continental to prove otherwise.

OVERALL, HOW SATISFIED ARE YOU WITH YOUR CYLINDERS?



iLevil 2 SW ADS-B: Improved GPS and Traffic

This receiver is unique for having solar cells to extend battery life. But that will cost a $300 premium over the Stratus 2S and Garmin's GDL 39.

by Paul Bertorelli

While portable GPS enjoyed a rousing market for more than a decade, portable ADS-B hasn't been quite so impressive. The technology is mature enough that new products either fix bugs or show incremental improvements and the latter defines the latest portable from Levil Technology, the iLevil 2 SW.

Levil was an early entrant into the ADS-B portable segment with a small, battery-operated device that held its own against competition from Sagetech, Appareo and eventually Garmin. Levil's first product, the iLevil, received FIS-B weather and single-channel traffic from nearby aircraft using the 978 MHz protocol.

The company's newest model, the $1195 iLevil 2 SW ups the ante, but only by a couple of chips. The company claims better performance in a slightly larger unit that's also three ounces heavier. As consumer electronics companies tend to do, Levil has held the line on price against the previous model. For apps, you can find iOS and Android products compatible with the iLevil 2 SW.

LOTS OF FEATURES

The iLevil 2 SW swims in the top tier of ADS-B portables, meaning it has what has become standard features: ADS-B FIS-B reception combined with a remarkably capable AHRS unit that outputs attitude, altitude and speed information. However, since the altitude and speed data is derived via GPS, it's GPS altitude, not pressure altitude and GPS speed, not indicated or true airspeed.

If you're really hard over on having the air data, Levil Technology has the iLevil 2 AW which, at $1395, has pitot-static input and can display indicated airspeed and pressure altitude. However, it will require breaking into the airplane's plumbing and running some tubing into the device. In addition to being a regulatory grey area, that may be more trouble than many owners want to bother with for a portable. But it is unique to Levil products and is certainly suitable for experimentals and LSAs.

Also unique is a small solar panel atop the unit, which Levil claims extends the battery life by about an hour. Battery life is claimed at five hours, but we weren't able to test it to exhaustion nor can we confirm that the solar panel extends battery life by as much as Levil says. One thing we are sure of is that on a warm day up on the glareshield, the entire unit gets quite warm to the touch, a characteristic it shares with other products of this type, especially the Sagetech Clarity models.

The iLevil 2 SW includes an onboard WAAS GPS with an internal antenna and an external rod antenna for the ADS-B. So if your tablet isn't equipped with its own GPS, Levil has you covered. It communicates with the tablet (or phone) through a Wi-Fi node that proved robust in our flight trials. The node will support up to 10 devices, so your passengers—if they have the apps—are free to use it.

Speaking of apps, the iLevil supports 11 iOS apps and six Android apps. The biggie for iOS is WingX Pro and there's limited support for ForeFlight, not to include weather. As we've reported, ForeFlight is somewhat exclusively locked into Appareo's Stratus. (For a review on the latest version of that, see the September 2015 issue of *Aviation Consumer*.) Levil also offers its own free app, an AHRS utility, and although the price is right, it only displays AHRS info; no weather or traffic. For traffic, you'll need one of the other apps

The new iLevil 2 SW ekes more endurance out of its batteries thanks to a small solar array, right. Five hours endurance is claimed.

Thanks to the AHRS feed, WingX Pro, left, can display both position and nav data and an accurate attitude indicator. With dual-frequency traffic capability, the iLevil 2 SW sees a lot more traffic than the previous model did, lower left. High-altitude targets are 1090 MHz ES transponders.

and with those, you'll be able to see traffic broadcasting on two channels, the 978 MHz boxes being queried by other UAT units and ATC and 1090 MHz extended squitter Mode-S transponders. For that reason, you tend to see a lot of high-altitude airline traffic and some—but most assuredly not all—of the nearby low-altitude traffic that you really want to see.

If you're looking for an argument to buy ADS-B Out, the fact that it will assure receiving the full ATC traffic package might be the best one. A portable may or may not figure into that buying decision.

The iLevil's onboard AHRS senses roll, pitch, magnetic heading, rate of turn and also has G-meter output for those apps equipped to display it.

FLIGHT TRIAL

Rigging the iLevil for flight doesn't involve much. If you want to go solar, find a place where it can see sunlight and switch it on. The wireless immediately comes up and once selected from the settings page, the tablet is talking to the iLevil. The device can be operated on ship's power and it's shipped with a dual-port 12-volt-to-USB converter intended to power both the iLevil and a tablet. For longer flights, that may be worth the trouble of the cockpit spaghetti fest. Otherwise, five hours of operation may be sufficient.

We tried the iLevil 2 SW on three local flights and found it quite unremarkable, in the sense that it performed basically as the company claims and it's consistent with competitors from other companies. Propped on the hatrack of the Cub, it had no trouble locking on to both GPS and ADS-B signals. The latter is spotty until airborne, but it seems robust even before reaching pattern altitude.

Perception of how well portable ADS-B performs is colored by the app or tablet used. We piped the output into an iPad Air 2 using iOS 8.4.1 and Levil's own AHRS utility plus WingX Pro. As promised, we found good GPS performance and traffic and FIS-B availability. Levil claims that the iLevil 2 SW has more sensitive ADS-B and GPS receivers, but we have no way of measuring this. The previous model performed with no complaints nor any drop-outs and so does the improved model.

For experimental and light sport aircraft, in addition to the pitot inputs, the iLevil 2 AW has two serial outputs. These can be used to display engine operating data and to drive an autopilot with AHRS output.

The chart on page 20 puts the iLevil series in feature and price context with other options. Pricewise, it's competitive with the Sagetech Clarity but higher than the Appareo Stratus 2S and Garmin's GDL 39. In a future issue, we'll do a side-by-side fly-off of all the ADS-B portables. For now, the iLevil 2 SW and AW are competent products that perform well, in our estimation.

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MANDATE-COMPLIANT, PANEL ADS-B PRODUCTS

PRODUCT	ADS-B SPECS	DISPLAY INTERFACES	PRICE	COMMENTS
APPAREO				
STRATUS ESG	1090ES ADS-B TRANSPONDER	N/A	$3490	Has internal WAAS GPS, interfaces with Stratus portable
ASPEN AVIONICS				
ATX100	978 UAT OUT, 978 UAT IN	EVOLUTION MFD	$2645	Requires external GPS, available Q2 2015
ATX100G	978 UAT OUT, 978 UAT IN	EVOLUTION MFD	$3495	Has internal WAAS GPS, ADS-B In and Out
AVIDYNE				
AXP340	1090ES ADS-B TRANPONDER	N/A	$3995	Partial plug-and-play with some existing BendixKing KT76A/C KT78A transponders, requires WAAS GPS input.
MLB100	978 UAT IN	IFD540/IFD440	$2495	Compatible with Avidyne's IFD540 navigator.
BENDIXKING				
KT74	1090ES ADS-B TRANSPONDER	N/A	$2999	Partial plug-and-play with KT76A/C, KT78A transponders, requires WAAS GPS input
KGX130	978 UAT IN	IOS TABLET MFD TRAFFIC ONLY	$1489	ADS-B In only, for use with 1090ES transponder
KGX150	978 UAT OUT, 978 UAT IN	IOS TABLET MFD TRAFFIC ONLY	$4069	Has internal WAAS GPS.
KGX150	978 UAT OUT, UAT IN	IOS TABLET MFD TRAFFIC ONLY	$3489	Version without internal WAAS GPS
FREEFLIGHT SYSTEMS				
FDL-978-TX	978 UAT OUT	N/A	$2995	Has Diversity, includes control head
FDL-978-XVR	978 UAT OUT, 978 UAT IN	IOS, ANDROID MFD TRAFFIC	$3695	Has Diversity, includes control head and WiFi module
FDL-978-XVR	978 UAT OUT, 978 UAT IN	IOS TABLET MFD TRAFFIC	$4495	Internal WAAS GPS, includes WiFi module for tablet use
FDL-978-TX/L	978 UAT OUT	N/A	$1995	Lite version, no ARINC card, upgradeable to ADS-B In
FDL-1090-TX	1090ES ADS-B TRANSPONDER	N/A	$4495	Remote control head/processor design, requires WAAS GPS input
GARMIN				
GTX330ES	1090ES ADS-B TRANSPONDER	N/A	$3995	Requires external WAAS GPS input
GTX33ES	1090ES ADS-B TRANSPONDER	N/A	$5450	Remote version of GTX330ES
GDL84	978 UAT OUT, DUAL-BAND IN	IOS, ANDROID TABLETS	$3995*	Standalone ADS-B Out and In, wireless Bluetooth connectivity with Flight Stream 110/210. Requires Garmin Pilot, ForeFlight tablet app. *$4495 with Flight Stream 210 (built-in AHRS)
GDL88	978 UAT OUT, DUAL-BAND IN	GNS530W/430W GTN750/650 G600/500 *IOS/ANDROID	$3995	Requires WAAS GPS input, tablet interface requires Flight Stream wireless Bluetooth module, Garmin Pilot or ForeFlight app
GDL88-W	978 UAT, DUAL-BAND IN	GNS530W/430W GTN750/650 G600/500 *IOS/ANDROID	$5143	Has built-in WAAS GPS receiver, tablet tablet interface requires Flight Stream wireless Bluetooth, Garmin Pilot or ForeFlight app
GDL88-D	978 UAT, DUAL-BAND IN	GNS530W/430W G600/500 GTN750/650 *IOS/ANDROID	$4495	Diversity model (requires top and bottom antenna installation), requires WAAS GPS input, tablet tablet interface requires Flight Stream wireless Bluetooth module, ForeFlight or Garmin Pilot app
GDL88-WD	978 UAT, DUAL-BAND IN	GNS530W/430W GTN750/650 G600/500 *IOS/ANDROID	$5643	Has built-in WAAS GPS receiver, Diversity (requires top and bottom antenna installation), tablet tablet interface requires Flight Stream wireless Bluetooth module, ForeFlight or Garmin Pilot app
L-3 AVIATION LYNX				
NGT-9000D+	1090ES ADS-B TRANSPONDER DUAL-BAND ADS-B IN	SELF-CONTAINED, GARMIN MX20	$11,933	Rack-mounted, internal WAAS, TAS, Diversity, displays traffic on any display that accepts Skywatch data
NGT-9000D	1090ES ADS-B TRANSPONDER DUAL-BAND ADS-B IN	SELF-CONTAINED, GARMIN MX20	$8133	Has Diversity, but no internal TAS

MANDATE-COMPLIANT, PANEL ADS-B PRODUCTS (CONTINUED)

PRODUCT	ADS-B SPECS	INTERFACES	PRICE	COMMENTS
NGT-9000+	1090ES ADS-B TRANSPONDER DUAL-BAND ADS-B IN	SELF-CONTAINED, GARMIN MX20	$9200	Has internal TAS, but no Diversity
NGT-9000	1090ES ADS-B TRANSPONDER DUAL-BAND ADS-B IN	SELF-CONTAINED, GARMIN MX20	$6800	No Diversity, no internal TAS
NGT-2500	978 UAT OUT, 978 UAT IN	MX20, TABLET	$3467	iOS, Android tablet interface requires $270 optional WiFi module, $1223 control panel may be required
NGT-2000	978 UAT OUT, 978 UAT IN	TABLET	$3200	Requires $270 WiFi module, built-in WAAS GPS, could require $1223 optional control panel
NGT-1000	978 UAT OUT	N/A	$2132	Basic mandate-compliance, built-in WAAS GPS, could require control panel installation
NAVWORX				
ADS600	978 UAT IN	Garmin MX20, GMX200 *GNS430/530/G500/600	$1199	*Garmin display interface will overlay traffic only. $2399 version with internal GPS can interface to 1090ES transponders
ADS600-B	978 UAT IN, 978 UAT OUT	Garmin MX20, GMX200 *GNS430/530/G500/600	$2399	Has non-certified built-in WAAS GPS for aircraft that don't need to comply with ADS-B mandate
ADS600-BG	978 UAT IN, 978 UAT OUT	Garmin MX20, GMX200 *GNS430/530/G500/600	$3499	Built-in mandate-compliant WAAS GPS, complete with antennas and installation hardware
SANDIA AEROSPACE				
STX360	978 UAT IN/OUT	INTERNAL	TBD	Mode A/C transponder with integral ADS-B In/Out
TRIG AVIONICS				
TT31	1090ES TRANSPONDER	N/A	$2568	Requires external WAAS GPS input, KT76A/C replacement
TT22	1090ES TRANSPONDER	N/A	$2595	Remote control head and processor

NON-CERTIFIED PORTABLE ADS-B PRODUCTS

PRODUCT	PRICE	SIZE	ADS-B SPECS	BATTERY LIFE	MAJOR APPS SUPPORTED	COMMENTS
DUAL XGPS170	$549	4.3 X 2.7 X 0.8	978 MHZ	5 HOURS	WINGX PRO, FLTPLAN.COM, SEATTLE AVIONICS FLYQ, ADVENTURE PILOT IFLY	Convenient chassis design with nonskid base
SAGETECH CLARITY	$1150	2.5 X 2.5 X 1.5	978 MHZ 1090 MHZ	6 TO 8 HOURS	WINGX, ADVENTURE PILOT IFLY, GLOBAL NAV SOURCE, IPAD EFB, SKYVISION EXTREME	ADS-B only; no AHRS, dual band
SAGETECH CLARITY SV	$1400	2.5 X 2.5 X1.5	978 MHZ 1090 MHZ	6 TO 8 HOURS	WINGX, ADVENTURE PILOT IFLY, GLOBAL NAV SOURCE, IPAD EFB, SKYVISION EXTREME	Top overall performer for GPS, ADS-B and EFIS; smallest physical size; runs HOT
ILEVIL AW	$1395	4 X 2.5 X 1.0	978 MHZ	5 HOURS	WINGX, FLYQ, ADVENTURE PILOT, AHRS UTILITY, XAVION, AVNAV EFB, AVARE	Can be be hardwired, pressure transducer interface for airspeed/altitude
ILEVIL 2SW	$1195	4 X 2.5 X 1.0	978 MHZ	5 HOURS	WINGX, FLYQ, ADVENTURE PILOT IFLY, AHRS UTILITY, XAVION, AVNAV EFB, AVARE	Good performer, solar charging, now has dual frequency ADS-B
STRATUS II	$899	6 X 2.6 X 1.25	978 MHZ 1090 MHZ	8 HOURS	FOREFLIGHT ONLY	Good overall value; runs coolest; requires toggling to separate app to use EFIS
STRATUS I	$499	5.75 X 4.25 X 1.0	978 MHZ	8 HOURS	FOREFLIGHT ONLY	First-generation model, no AHRS, single-band receiver
GARMIN GDL39	$599 $699 W/ BATTERY	3.5 X 1.9 X 6.0	978 MHZ 1090MHZ	4 HOURS	GARMIN PILOT FOR IOS AND FOR ANDROID, GARMIN GPS396/496/696/AERA500 VIA CABLE, GARMIN 796	Bulky footprint, especially with optional battery installed
GARMIN GDL39 3D	$849 $899 W/ BATTERY	3.5 X 1.9 X 6.0	978 MHZ 1090 MHZ	4 HOURS	GARMIN PILOT FOR IOS AND FOR ANDROID, GARMIN GPS396/496/696/AERA500 VIA CABLE, GARMIN 796	Has AHRS output for driving Garmin Pilot attitude and synthetic vision display
SKYVISION SALUS-3 978UAT/1090ES	$1099	8.0 X 3.0 X 2.0	978 MHZ 1090ES	EXTERNAL VOLTAGE	XTREME VISION, WINGX PRO, SKYRADAR, ADVENTURE PILOT, XAVION	First portable solution attempting to meet ADS-B mandate certification
SKYVISION GEN2 PORTABLE	$3295	11.6 X 8.3	978 MHZ	EXTERNAL VOLTAGE	WINGX PRO, XTREME VISION, SKYRADAR, ADVENTURE PILOT, XAVION	Uses NavWorx UAT transceiver, packaged in a "briefcase" housing, TSO-approved

Spot GEN3 Tracker: Versatile, Priced Right

It lacks on-the-fly text editing, but for $150 we think Spot's latest-gen satellite tracker has enough useful features to fill the gap when off the cellular grid.

by Larry Anglisano

CHECKLIST

- ⊕ Annual service pricing is far cheaper than Iridium data fees.
- ~ You still gotta have an ELT attached to the aircraft. Consider this a belt and suspenders.
- ⊕ Registering the Spot with Lockheed Martin Flight Services enables position monitoring for VFR flights.

We've been on enough flying, boating, hiking and other adventure outings that put us out of cellular reach of family members accustomed to knowing our every move. That's a communication void Spot is trying to fill with its latest GEN3 global satellite GPS messenger and tracking device.

The device can serve double duty for sending predetermined text messages to the recipients of your choice, while also offering real-time Internet tracking, plus SOS functionality.

Compared to satellite phones which require price airtime plans, the Spot has some limitations (it has no voice capability or real-time text editing), but its low price and flat-rate service fee makes it a worthy addition to a survival pack for traveling outside of cellular and Wi-Fi coverage.

FORM FACTOR

At 3.43 by 2.56 by 1.0 inches and weighing 4 ounces with four AAA batteries installed, Spot's GEN3 is just the right size for stashing in a jacket pocket or hanging from a structure using the included carabiner and tether strap. The contoured device is equipped with a USB interface for 5-volt line power input and for data download and upload, but battery endurance is much improved over earlier models.

Like earlier Spot trackers, the GEN3 determines its location with an internal GPS receiver and communicates over the Globalstar phone and data satellite constellation. Ground-based antennas route the data through a dedicated network, providing worldwide coverage.

Spot makes it clear that the device needs a clear view of the sky for optimum GPS reception, with the face of the unit pointed up. It worked well when placed on the glareshield of a Piper, but not so well when shielded by the sidewall and instrument panel (there is no external antenna.) A GPS mode annunciator blinks green if the receiver sees the satellites and blinks red if it doesn't. We took the device on a motorcycle trip deep in the mountains and the receiver performed well even when other GPS receivers didn't. The GEN3 has a maximum operating altitude of 21,320 feet.

The GEN3 has improved buttons with a positive feel, lending to a rugged overall control set. A single power button is located on the upper side of the case, while a power status annunciator is at the top of the device's face. Two keys which you don't want to inadvertently hit—SOS and HELP/ASSIST—are guarded with rubber pull-away covers on the center of the face. More on those in a minute.

MOTION ACTIVATION

Since the device has full-time tracking capability, an internal vibration

We like the Spot's palm-sized footprint and rugged build quality, but its GPS reception suffered when held positioned low in the cockpit.

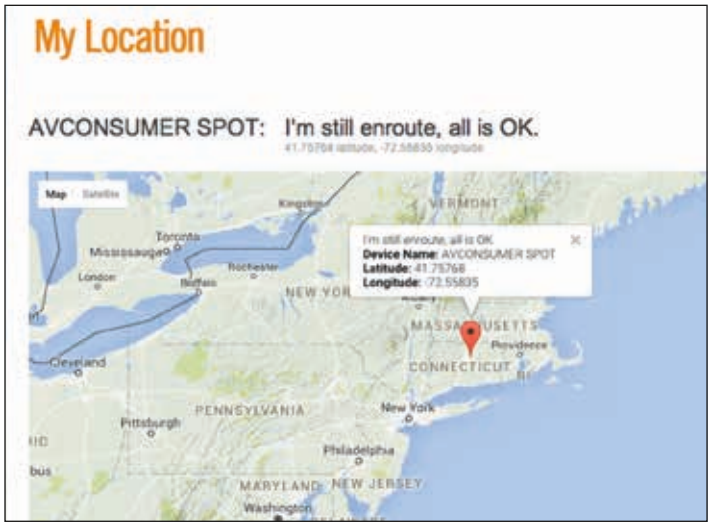
SPOT CONTROL SET

sensor commands the device to transmit GPS location whenever it is moving. When the device is stationary for more than five minutes, it enters a suspended track mode, but will automatically send one more track waypoint from the resting location. Spot says this helps conserve battery life. It doesn't state exact specifications for battery endurance, since this depends on temperature, the amount of messages you transmit and whether the GPS receiver struggles to lock on. You can help conserve power by setting the frequency of the device's transmission.

For example, the preprogrammed tracking modes are customizable for either 2.5-, 5-, 10-, 30- or 60-minute intervals when you subscribe to Spot's Unlimited or Extreme tracking service packages.

Others can track your progress in near real-time using the Spot Shared Pages function, which uses Google Maps and a virtual breadcrumb trail of your movement. To initiate the tracking, simply press and hold the Track button and the device sends current GPS position as a waypoint as determined by the frequency of preset track updates.

Preset recipients get an email or text message linking them to your location and exact coordinates on a map, bottom photo, in addition to the message profile you set on Spot's Internet-based configuration program.



Pressing the SOS button sends an alert directly to the GEOS International Emergency Response Coordination Center (IERCC), which notifies emergency responders (Coast Guard, local police and other agencies) of the SOS situation. This is based on GPS location and the personal information you entered on findmespot.com during account and device activation. The Sending Message annunciator confirms that the SOS was sent. You also have the option of cancelling an SOS by holding the SOS button until it turns red.

After logging into your account, you can edit custom messages, help and assist messages and check-in text message profiles which can be sent to email addresses and phone numbers of your choice. Additionally, you can link the transmitted data for posting to a Facebook and Twitter account.

The GEN3 tracking mode can interface with Lockheed Martin Flight Services' Surveillance-Enhanced Search and Rescue to trigger alerts when a VFR flight is overdue at the destination by 30 minutes. Lockheed also uses the tracking to issue reminders to close a VFR flight plan.

SERVICE PACKAGES

The Spot won't work without a valid subscription and activation. The entry-level $149.99 per year ($14.99 per month) basic service includes unlimited predefined custom, check in, tracking, SOS and help request messages. With the base package, the tracking function transmits the GPS location every 10 minutes continuously for 24 hours. An additional $49.99 per year extends the transmission beyond 24 hours and allows you to preset tracking intervals. For pilots, Spot recommends the Extreme package, which tightens the tracking interval to 2.5 minutes.

Since most search and rescue efforts will conclude with you paying the tab, the $17.95-per year GEOS search and rescue member benefit add-on covers up to $100,000 in search and rescue expenses. This also covers expenses accrued by private rescue contractors. For $30 per year, the Help/Spot Assist function sends GPS position for roadside and maritime assistance.

The GEN3 comes with batteries, yet another USB cable for the drawer, plus a strap and carabiner. Contact www.findmespot.com.

SATELLITE TRACKERS: 406 ELT KILLERS?

If the Internet killed the MTV video star, then it's also pulling the plug on new ELT installations. With family and friends glued to flight tracking websites like flightaware.com, plus their smartphones for satellite-delivered texts, emails and tracking maps, it's no wonder old-school ELT sales are tanking. We actually saw a slowing of ELT installations several years ago when Transport Canada backed off on its initial threat of mandating 406 MHz beacons for flights in Canadian airspace (a threat that sparked a rumor of similar regulations in the works for the U.S.) Coincidentally, that was roughly the time that satellite messengers hit the market and also when NOAA's SARSAT (Search and Rescue Satellite Aided Tracking) stopped listening for 121.5 MHz ELT pings. But based on our discussions with several busy avionics shops, sales and installations of modern 406 MHz ELT systems aren't dead—yet—even as flyers snag $150 satellite communicators, including Spot's GEN3 messenger and more expensive systems like the Spidertracks and DeLorme InReach Iridium-based communicators. There are reasons why ELT technology is hanging on.

First, ELT systems are still required by FAR 91.207 which says, in part, the system (while complying with TSO-C91) must be permanently attached to the airplane. This means that portable beacons and satellite messengers can't serve as substitutions. In a perfect situation, the crash impact will automatically activate the beacon—something a personal tracking device won't do. It's been said that a 406 MHz beacon should activate 83 percent of the time on its own, while the presence of a panel activation switch could fill in the gap. But a personal tracking device betters an installed ELT in that it can stay with you should the aircraft sink in water. Plus, you can walk around with a tracking device as we once did with a personal beacon after ditching in a field.

One ELT technology that doesn't seem to be catching on among buyers is GPS-based 406 MHz beacons, either ones connected to a panel-mounted GPS or beacons with internal GPS receivers. With a GPS interface, the beacon transmits the last known GPS coordinates along with the aircraft tail number and pilot information, guiding rescuers within 100 meters of your position.

But the cost of a GPS-equipped system (over $1000) or the teardown effort required to wire a beacon to the panel could hinder sales. Kirk Fryar at Sarasota Avionics in Venice, Florida, told us his company doesn't install nearly as many new ELT systems as it once did, and performs even fewer installations with a GPS interface. A look at the installation effort and the price that tags along hints that high costs have something to do with the decline in upgrades.

"It's rare that a customer even realizes that some newer 406 MHz beacons can be connected with a GPS. When we offer them the option, they often don't care enough about the capability to pay for the expense," Fryar told us. That expense can be sizable because it requires a wired RS-232 databus connection from the panel GPS to the beacon. And since the beacon sits in the rear of the fuselage, it's not uncommon for the shop to remove the interior to run the cabling—in addition to disassembling the radio stack to gain access to the GPS connectors.

Of course, it's also not uncommon for shops to remove the interior anyway when upgrading ELT systems. That's because 406 beacons require a panel-mounted activation switch. Since the older 121.5 MHz beacon might not have a remote switch (and if it does the wiring might not be compatible), an expense with new ELT installs is routing the new cabling through the cabin.

Chris Girman at CE Avionics in Sanford, Florida, also reports a declining interest in 406 MHz beacons as standalone installations, but hinted that installing them in concert with avionics is easier to sell.

"If we get an aircraft in the hangar that doesn't already have a modern 406 beacon installed, we'll always suggest installing one along with the other new avionics. While we hardly ever have a customer say no to the idea, you can tell that ELT systems aren't high on their list of priorities," Girman said.

Your decision to pass on a 406 ELT installation in favor of relying on a satellite tracking device might depend on your confidence in satellite tracking technology. As proven during our Spot GEN3 evaluation, satellite trackers require a clear shot of the sky for GPS lock-on. If you're trapped in an inverted aircraft, there is no guarantee for reliable GPS performance. Moreover, personal tracking devices rely on ground-based gateways to process and switch messages. For the 66-satellite Iridium networks (used by DeLorme's InReach and Spidertracks) there are two ground-based gateways. Globalstar's 48-satellite network uses 24 gateways.

Speaking of confidence, a point we heard from more than one shop pertains to annual ELT certification of newer 406 MHz beacons. If your shop doesn't have the equipment to fully test your 406 beacon (and many don't, given the cost), you could fly away with a false sense of security. Whether you leave this chore up to the folks who perform your annual inspection or an avionics shop, ask if they have the test equipment to fully check the system.

We'll take a fresh look at the existing market of 406 MHz ELT systems in an upcoming report.

Pilatus PC-12:

A beefy turboprop single that can haul almost anything you can fit inside. It's also a forgiving step-up aircraft, but quality training is a must.

Some airplane manufacturers build a model based on what it thinks a typical private owner might do with it. Not Swiss manufacturer Pilatus. For decades Pilatus has built models—including the PC-12 turboprop single—to specifically meet the missions of armed services throughout the world, including the U.S. Air Force (U-28A). Moreover, the PC-12's launch customer was the Royal Flying Doctor Service of Australia for its work in the extremes of the outback—an environment that suits the PC-12 just fine. Got unimproved runways? The PC-12's oversized tires can handle it, while trailing-link landing gear and an effective rudder make the single-pilot-approved big turboprop easy to land.

Still, the PC-12 turned out to be more versatile than perhaps even Pilatus envisioned. That's because it works just as well hauling owner-flown dirt bikes (we're talking motorcycles, by the way) as it does corporate executives and charter passengers, thanks to a posh rear cabin that's configurable in several seating arrangements. Pilatus is hardly a newcomer to the aircraft market.

Formed in 1939, Pilatus Aircraft Limited rolled out its first aircraft in 1945 and enjoyed much success with training and utility aircraft, including the P-2, P-3, PC-7, PC-9 and the PC-21. Before the PC-12, however, Pilatus was well known for the PC-6 Porter, a STOL-equipped utilitarian turboprop single that is popular for hauling skydivers, among filling other unique missions. But the Pratt PT6A-powered PC-12 is different, combining impressive amounts of utility with high-end styling and performance, including a nearly cross-continental range and a cruise speed that flirts with 280 knots in newer models.

The PC-12 works just as well hauling off-road motorcycles as it does corporate executives.

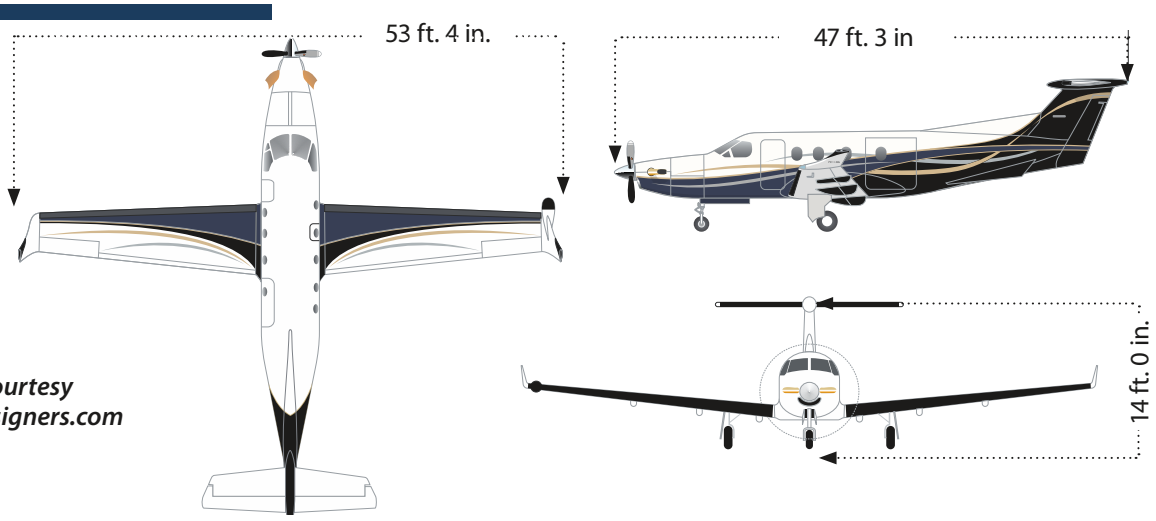
Strap in to a PC-12's BWM-designed interior and you'll appreciate a generous fit and finish that you should expect from an airplane with a price tag that's well north of $1.5 million for an older model and $3.5 million-plus for a newer one.

MODEL SERIES

Pilatus delivered the first PC-12s in 1994, starting with the model PC-12/41, which had a 9039-pound maximum takeoff weight. If you're searching the used market for an early one, you'll be hard pressed to find a PC-12/41 that hasn't be modded (via landing gear mod and a paperwork change) for a 9920-pound maximum

A 2007 PC-12/47, main photo, retails for around $2.5 million, which is slightly higher than a same-year Socata TBM850.

PILATUS PC-12

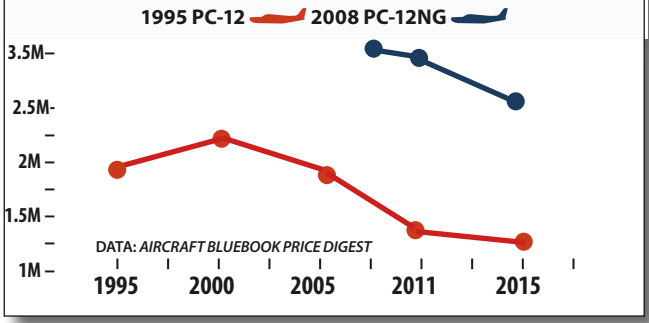


Drawings courtesy www.schemedesigners.com

SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL (LBS)	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1995 PC12-41	P&W 1200 SHP PT6A-67B	3500	$400,000	2704	4020 LBS	270 KTS	±$1,300,000
1996-1997 PC12-41	P&W 1200 SHP PT6A-67B	3500	$400,000	2704	4020 LBS	270 KTS	±$1,500,000
1997 PC12-45	P&W 1200 SHP PT6A-67B	3500	$400,000	2704	4020 LBS	270 KTS	±$1,500,000
1998-1999 PC12-45	P&W 1200 SHP PT6A-67B	3500	$400,000	2704	4020 LBS	270 KTS	±$1,700,000
2000-2003 PC12-45	P&W 1200 SHP PT6A-67B	3500	$400,000	2704	4020 LBS	270 KTS	±$2,000,000
2002-2003 PC12-45	P&W 1200 SHP PT6A-67B	3500	$400,000	2704	4020 LBS	270 KTS	±$2,000,000
2004-2005 PC12-45	P&W 1200 SHP PT6A-67B	3500	$400,000	2704	4020 LBS	270 KTS	±$2,300,000
2006-2007 PC12-47	P&W 1200 SHP PT6A-67B	3500	$400,000	2704	4020 LBS	270 KTS	±$2,500,000
2008-2009 PC12-47E NG	P&W 1200 SHP PT6A-67P	3500	$400,000	2704	4020 LBS	280 KTS	±$3,000,000
2010-2011 PC12-47E NG	P&W 1200 SHP PT6A-67P	3500	$400,000	2704	4020 LBS	280 KTS	±$3,500,000
2012-2013 PC12-47E NG	P&W 1200 SHP PT6A-67P	3500	$400,000	2704	4020 LBS	280 KTS	±$3,900,000
2014 PC12-47E NG	P&W 1200 SHP PT6A-67P	3500	$400,000	2704	4020 LBS	280 KTS	±$4,500,000

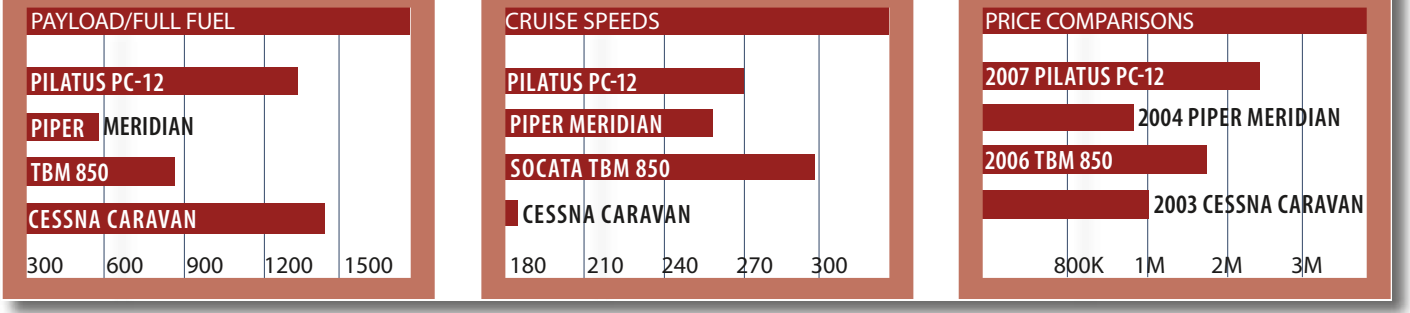
RESALE VALUES



SELECT RECENT ADs

AD 2009-05-07	REAR STICK PUSHER CABLE
AD 2005-04-16	WINDSHIELD DEICE WIRING
AD 2003-20-15	FUEL BOOSTER PUMP REPLACEMENT
AD 2001-22-15	CARGO DOOR LIGHTENING HOLES
AD 99-17-01	REPLACE WING FLAP DRIVE SHAFTS

SELECT MODEL COMPARISONS



With a posh configurable executive interior, top, the PC-12 is worthy for charter and corporate missions. An overhauled engine swap for the 3600-hour TBO Pratt PT6A-66B could be a $400,000 setback.

takeoff weight, essentially making it a PC-12/45 designation—the second series of PC-12 introduced around 1996. Up until the current PC-12NG model, Pilatus incrementally bundled modifications and improvements into 11 groups of airframe serial numbers. This means if you were to buy a new PC-12, it would incorporate all of the improvements made to the aircraft over time. But if you're shopping the used market, you'll focus on the more significant changes associated with a given series. Some upgrades (through service bulletins) were more substantial than others.

For example, the series three (serial numbers 141-160) brought the previously mentioned gross weight increase from 9040 pounds to 9920 pounds (which ultimately became standard beginning with serial number 181). Series four (serial numbers 161-180) brought new pilot and copilot seating with improved adjustment mechanisms, plus passenger seats certified for the increased gross weight. Series five (serial numbers 181-200) included new heat ducting in the cabin, a new oxygen shutoff lever in the cockpit, a 60-second engine start relay, plus head impact modifications to the passenger seating. More major modifications were incorporated in series 10 aircraft, starting with serial number 401 through 888 (later serial numbers upgraded the aircraft to the PC-12/47). This included a new EIS, which incorporated an engine condition monitoring system (ECMS), allowing the EIS to capture all critical engine parameters for download to a laptop computer for engine trend analysis. There were also some avionics upgrades, including the addition of the Bendix/King KLN90B approach-approved GPS, the KMD850 multifunction display, EGPWS, weather radar and TCAS.

It's worth noting that many early PC-12s have substantial aftermarket avionics upgrades, which might replace the Bendix/King avionics with Garmin GNS530 and GNS430 navigators, plus Garmin G600 PFD to replace Bendix/King EFIS displays. Earlier models had Universal EFIS.

Outside the aircraft, the dash 47 model brought new winglets, a new empennage dorsal fin, new ailerons for better roll handling and new LED lighting. The series 11 is the current dash 47E model PC-12NG, which begins with serial number 1001. More on this model in a minute.

MAJOR SYSTEMS, LOADING

The PC-12's flight controls are cable driven, although the ailerons have pushrods in some sections. Unlike the Cessna Caravan and even Socata's TBM-series turboprop, the PC-12 doesn't have spoilers for roll control, thanks to the smaller aileron size. After some complaints about heavy ailerons, Pilatus installed servo tabs on the ailerons, which, combined with the third generation of winglet design, delivered acceptable roll forces and response, nicely harmonized with pitch and rudder forces and an aileron/rudder interconnect. Max flap travel of the semi-Fowler flaps is 40 degrees. In flight, that allows for a dramatically steep rate of descent at 85 KIAS.

There are angle-of-attack vanes on each wing, providing data to dual AOA systems that drive a stick shaker and pusher. Stalls are prohibited, as the airplane could not meet the certification requirements regarding maximum roll-off at the stall break with full flaps and full power. AoA data is displayed on the flight director (and on the PFD in the NG model), which makes holding the right speed for a given landing weight easy. At max takeoff weight, stall speed is 67 knots.

Up front, a 1605-SHP Pratt and Whitney PT6A-67B spins a four-blade, full-feathering Hartzell prop. On pre-NG models, the engine is derated to 1200 SHP for five minutes on takeoff and 1000 SHP for continuous operation.

Max gross weight for the PC-12 is 10,495 pounds, with max takeoff at 10,450 pounds. The early-gen PC-12 *Aviation Consumer* flew back in 2007 for a review weighed 6474 pounds empty, giving it a useful load of 4021 pounds. With all 2704 pounds of fuel aboard, 1317 pounds may be carried in the cabin, or six 200 pounders and more than 100 pounds of baggage. For the pilot-plus-four range question used for evaluating VLJs and single-engine turboprops at the time, the answer for the older PC-12 is that a pilot plus five can still carry full fuel and go 1500 nautical miles at max speed cruise with NBAA reserves, meaning it can miss the approach and go to an alternate 100 miles away.

The zero-fuel weight is 9040 pounds, which allows a hefty 2566 pounds in the cabin. In sample loading problems, we found that with just two people up front, the airplane was near the forward CG limit. Keeping just the pilot aboard and then loading the maximum 400 pounds in the aft baggage area (behind the rear seats) and then 500 pounds in the back end of the cabin, moved the CG to near the aft limit, indicating a satisfactory CG range in service. Max landing weight is 9920 pounds, so 575 pounds of fuel have to be burned off following a max gross launch.

For occupant protection in an accident, no hydraulic or fuel lines penetrate the pressure vessel and the 406 gallons of fuel (402 gallons usable) in the wings (53-foot 4-inch span) is as far outboard as possible. Fuel balancing is automated, so the pilot doesn't have to mess with tank selection or take any action unless the system should fail or a line person fills one tank much more than the other.

The upside is that it was done in a fashion that fuel burn doesn't affect the aircraft's center of gravity; the downside is that there's fuel all the way to the leading edge, so it's only protected by a deicer boot and the leading edge aluminum in the event of a crash. Pilatus pointed out that the wing skin is made of stiffened clad aluminum alloy, riveted to the spar and ribs. The PC-12 does not have easily punctured fuel tanks and, to our knowledge, has never experienced a fuel leak as a result of minor wing damage or a fire due to major wing damage.

The PC-12NG has Honeywell's Pilatus-specific Apex avionics suite, top. It's easily a single-pilot airplane, but copilots get full instrumentation and a control yoke with full mode-switch redundancy, middle, plus redundant AoA system, bottom.

Virtually all of the systems, as well as the engine, can be accessed via doors or hatches that unlatch and swing open easily—only one access port has to be unscrewed during a 100-hour inspection. Lubrication oil quantity is checked via a sight gauge after landing, reducing the chance of engine failure because someone forgot to replace the dipstick correctly. The oil filler cap has a vertical stripe of paint on it to quickly indicate if it's correctly screwed on.

CABIN, COCKPIT CONTROLS

Until the advent of the PC-12, it was often said the workhorse of general aviation missions was the Beech B200 King Air. It's no surprise that the PC-12 was designed to be gener-

Got motorcycles to haul? Pull the rear seats and load them through the PC-12's huge electric cargo door, top. On the ramp, a PC-12 stands tall at 14 feet, while an airstair door leads the way to a cabin that's wider than a King Air 200's, bottom.

ally similar in size and performance to the King Air, but at a sizable cost advantage with only one engine.

At 5 feet wide with nearly 5 feet of headroom, the PC-12's cabin is slightly larger than a King Air 200, with the extra width noticeable once inside. The seats recline and swivel and have three-point restraints. There's also a potty opposite the airstair door, with its own solid door for privacy.

Speaking of doors, the head-turner with a PC-12 is its 53- by 52-inch aft cargo door. It's hinged to open vertically hydraulically, although it closes via an electric motor and can also be operated manually. The latching mechanism for it and the main cabin door is easy to operate and the telltales showing the position of the latching pins were obvious and easy to read. A forklift can approach the fuselage at a 90-degree angle. The cockpit is comfortable for virtually any size pilot. The step past the console is not particularly difficult and while we would prefer a side stick from a crashworthiness perspective, the control yoke slides out of the panel so there's no column to take up floor space. The crew seats adjust vertically and horizontally, tilt, have lumbar support and four-point restraints. One unusual feature in an airplane this size is adjustable rudder pedals, which allows the pilot to obtain the eye position recommended by lining up two small balls on top of the magnetic compass.

The PC-12 has an all-electric trim system, controlled via a toggle on each control yoke. Power control is single-lever, just like a jet, with no manual RPM control.

Starting a PC-12 is conventional for a turboprop. Hit the starter button, then introduce fuel at about 14 percent RPM and monitor to assure the start stays within temperature parameters. Once the PT-6 is running, the two generators and avionics master switches are turned on and it's time to taxi.

Once off the runway (with a 2650-foot takeoff distance at max weight), the PC-12 can climb at 1920 FPM. With reverse beta, landing distance over a 50-foot obstacle is 1830 feet.

NEXT-GEN PC-12NG

Certified in 2008, the PC-12NG (NG is next generation) has the Honeywell Primus Apex avionics suite. This is an all-digital four-display (two PFDs and two MFDs) glass cockpit with engine monitoring, aircraft configuration, pressurization, and environmental controls. The suite isn't touchscreen, but there is an option for a cursor control device

(CCD) with trackball, scroll wheel and buttons for making selections on the two large multifunction displays. The CCD is mounted in the center pedestal area, aft of the power lever.

The few times we've flown the PC-12NG, we walked away certain that pilots either transitioning from older PC-12s or from other aircraft will require healthy amounts of transition training to nail the Apex feature set. As one owner put it, "You need to be able to operate the Apex suite in preprogram mode—that is, without really thinking about what you're doing. It's not difficult, it's just different."

The NG also simplifies other cockpit chores and includes a digital dual-zone Environmental Control System for increased cockpit and cabin comfort, a fully automatic digital Cabin Pressurization Control System which requires no input from the pilot, and a redundant Power Generation and Distribution System.

The integrated nature of the Apex means lots of small conveniences. For instance, prior to engine start, the backup battery powers one MFD so you can input a flight plan, look at weather graphics from the XMWX satellite system and get a clearance from the secondary comm radio, to name a few chores. But the PC-12NG offers more than new avionics.

Increased performance comes from the PT6A-67P, which delivers 15 percent more thermodynamic power for faster climbs (the full 1200 SHP can be maintained to a much higher altitude) and better cruise speeds by utilizing single-crystal CT blades and a new compressor configuration. This boosts the max cruise speed to 280 knots from 270 knots, which is reflected in a slightly higher fuel burn, although range is minimally affected.

Maximum operating altitude is 30,000 feet, although owners tell us that going above FL280 is rarely worthwhile from a fuel burn perspective. Plan on burning 360 pounds, or 54 GPH on average.

MAINTENANCE, COSTS

Several operators we spoke with estimate hourly operating costs at around $700, depending on fuel and ancillary costs. When operated under FAR Part 91, annual inspections are required, but Pilatus shops suggest 100-hour inspections for heavy usage. We're told that a typical annual inspection could easily run $10,000 on a low-time model.

As for the PT6A-67B engine on the PC12, it has a 3500-hour TBO and *Aircraft Bluebook* says the average overhaul cost is $350,000, but we think that's on the low side. As we reported in the PT6 overhaul article in the October 2015 issue of *Aviation Consumer*, there are too many variables to nail across-the-board prices.

A hot section inspection (plan on $50,000) is generally recommended at 1750 hours, and 2000 hours maximum. The propeller has a 4000-hour or six-year TBO.

Buy a newer PC-12 and the airframe could still be under the seven-year, 5000-hour transferrable warranty, while the engine is covered for five years or 2500 hours. In our view, if you have to ask what stuff costs to maintain on a PC-12—or any turbine-powered aircraft—you'll be shocked when the invoices roll in.

As owner-flown PC-12NG pilot Al Simmons describes in the feedback section below, insurance underwriters will require solid PC-12 initial and recurrent training before issuing a policy, which could likely include flying with a mentor pilot highly experienced in the PC-12. This isn't uncommon in the turboprop and jet world. Even then, insurance rates will be all over the board.

According to *Aviation Consumer's* insurance editor Jonathan Doolittle from Hartford, Connecticut-based Sutton James Insurance, underwriters look favorably at PC-12 pilots stepping up from faster and more complex aircraft.

"Underwriters in general are looking for prior experience in anything that will make the pilot more suited to the airplane. I wouldn't recommend to someone that they go out and buy a Beech Baron twin, for example, to build some time before getting a Pilatus PC-12, but an underwriter looking at someone with time in a heavier, busier airplane will probably give him or her a little better deal on a premium," Doolittle said.

Doolittle also noted that while underwriters each have their own ways of weighting different types of experience, in general anything that will make the pilot more suited to

PILATUS CRASHES—NO SMOKING GUN

Our search of NTSB data for accidents involving the Pilatus PC-12 series airplanes turned up only 23 since the first was reported in 2001—and four were in countries outside the U.S. With so little data, there was no basis for forming any opinions about areas of concern.

We did note that five accidents involved loss of control inflight, all in IMC. Having flown the airplane a few times, we have been impressed with its ease of handling, so we're curious about the circumstances and the pilots in those events.

In one accident, a pilot who had not flown IFR in some seven years got an intensive refresher upon buying his PC-12. Later, while cruising with the autopilot engaged in what was reported to be light icing conditions, the autopilot disengaged during a turn. As the angle of bank increased, the pilot ran an autopilot test. The autopilot did a self-test as the airplane entered a diving spiral. After the airspeed was over redline, the pilot pulled back on the yoke, overstressing the airframe and causing an inflight breakup.

Two pilots lost control while climbing in IMC, one shortly after takeoff and one while deviating around weather. Neither got his airplane collected before descending into the ground.

One pilot was cruising his PC-12 at 800 feet above its 30,000-foot service ceiling when he reported an undefined instrument failure. The NTSB was unable to identify which instruments failed and whether backups were working when it examined the wreckage post-crash.

ATC noted significant airspeed and glideslope excursions before one PC-12 pilot stalled and spun his airplane into the ground three miles short of his destination airport while on the ILS in IMC.

There were two engine failures due to mechanical issues. In one case the pilot landed on a road but damaged the long-wing airplane hitting signs on rollout. The second was a little more exciting. Shortly after entering IMC following takeoff, the two-pilot crew heard a series of bangs from the engine and saw flames. They collaborated to shut the engine down and aim for where they thought the airport was. They found it successfully, but couldn't get stopped on the wet runway. The airplane hit the boundary fence.

We think the PC-12 has excellent ground handling—that was reflected in only two runway loss of control (RLOC) events, one following a fast touchdown in gusty winds and the other in calm winds on an icy runway.

One pilot shot the ILS with some extra speed tacked on in IMC, landed long with partial flaps and couldn't get stopped on the wet runway.

Improper weight and balance calculation led to loading a Part 135-operated PC-12 aft of the aft c.g. limit. On liftoff, the pilot discovered a lack of pitch control. He aborted the takeoff, but pitch oscillations led to a hard landing that damaged the airplane. He was able to stop on the remaining runway.

We expect to see at least one animal strike in our monthly UAG accident reviews. The PC-12 was no exception—elk ran onto a runway and collided with one PC-12 during rollout on a night landing.

A series of inexplicable decisions by a PC-12 pilot resulted in the death of all 14 occupants of his airplane. He failed to have icing inhibitor added when he had the airplane fueled. En route, ice built up in the fuel system, preventing one wing tank from feeding and leading to an increasing fuel imbalance between the wings.

Rather than divert and land before the imbalance reached the maximum allowable, the pilot continued toward his destination. While approaching the airport the fuel imbalance became so severe that the pilot lost control of the airplane and crashed—no fault of the PC-12.

flying the PC-12—or any step-up turboprop or jet—will probably either save him a little money or allow him to buy higher limits.

PC-12 owners enjoy an excellent type club in the Pilatus Owners and Pilots Association (POPA). Contact them at www.pilatusowners.org. POPA holds an annual convention, offers training courses and is a solid source of knowledge when it comes to owning and operating a Pilatus.

Our thanks to PC-12 instructor John Braun for his valued input to this review. Contact him at john@westernaerogroup.com.

OPERATOR FEEDBACK

I have been flying both the legacy and PC-12NG models for the past several years and now focus on providing transition training for pilots new to the cabin-class, turbine world. While the PC-12 has obvious differences from many single pistons, the ease of the transition may come as a surprise to many.

The first step in the transition requires initial training at either Flight Safety International (at DFW Airport) or at SimCom in Orlando, Florida. While the PC-12 does not require a type rating, and the FAA requires no practical test standards specific to the PC-12, the course is conducted in a type rating-like manner that makes it a truly invaluable and exciting experience for the pilot.

The full-motion simulator—currently only offered at FSI—is remarkably similar to the actual airplane, and once back in the airplane all it takes is making a few flights to begin to feel comfortable.

One of the first things pilots new to the PC-12 take time to become accustomed to is the sight picture. The Pilatus sits up high—higher than many jets—and takes several landings to get the sight picture dialed in. Working in the pilot's favor, however, are the speeds for takeoff and landing. In a normal 15-degree flap configuration, rotation comes at 82 knots while applying a comparable amount of right rudder to other high-performance singles. After cleanup, climbing to cruise altitude is best accomplished between 130-150 knots, depending on weight. Approach to landing with 30 degrees of flaps works beautifully between 95-105 knots while crossing the

numbers at 90 knots. The trailing-link gear makes touchdown almost imperceptible.

I would be remiss not to point out a couple of spots in flying the PC-12 that can cause problems for newer pilots. The first is engine and power management. Instead of cylinder head temperatures and manifold pressure settings, temperature and torque settings require close monitoring in the turbine world. Both are important settings for takeoff and cruise and exceeding the parameters in either category can be costly.

As a side note, one notable difference between the legacy and NG model is that the Legacy is limited to 720 degrees of continuous temperature, versus 780 degrees in the NG model. Between altitudes of 14,000–17,000 feet MSL, the pilot should keep a close eye on the temperature, as temperature becomes the limiting factor around this altitude. I've often seen pilots set up a proper climb profile after takeoff and forget to monitor temperature into the higher altitudes due to that fact that as the airplane gains altitude, torque tapers off and temperature increase without any changes by the pilot.

New to some Pilatus pilots is an AOA indicator that paints the precise airspeed to be flown in various configurations. As the pilot reduces power over the numbers, a level flight attitude should be maintained while applying only slight back pressure as the wings lose lift. A stick shaker and pusher will abruptly shake and push the nose over to prevent a stall, which can be catastrophic closer to the ground for the pilot not minding the angle-of-attack. To those pilots accustomed to a full stall, Cessna-type landing, the first few landings can come as a surprise if they start to suddenly feel the stick shaker.

In my view, the PC-12 is truly a dream to fly. A low operating cost, impressive safety record and forgiving flight characteristics make the PC-12 one of the best airplanes on the market in its class. For those seeking more information or who are considering making the transition to the PC-12, feel free to contact me at john@westernaerogroup.com.

John Braun
via email

My wife and I have owned and both fly our 2009 PC-12NG since new and totally enjoy it. This is our second PC-12. We bought a used 1999 PC12/45 in 2006 and flew it for three years. We quickly knew we made the right decision, so when the announcement was made that the new 47E model was coming, we got our deposit in and our name on the long waiting list and eventually took delivery of serial number 1116.

Susan and I are both 67 years old, but differ in that I have been a pilot since age 18 and Susan got her license at age 60. I got my instrument rating in a Piper Tri-Pacer and flew it for 13 years, most of which were after converting it to a tailwheel Pacer. Next came a Piper Lance in 1987 and by 2005, I had over 5000 hours and well over 1000 of actual instrument time. We moved up to a Piper Malibu for better speed and range for flying business trips around the eastern half of the country, plus trips to the Florida Keys from Connecticut without stops. But with the 140-gallon STC fuel onboard, there was no capacity beyond the two of us and a couple of bags. Within a year we made the move up to the PC-12.

Having logged 3000 hours of single-engine, high-performance time, plus some twin-engine experience, lots of real instrument experience and over 100 hours of pressurized

STATEMENT OF OWNERSHIP, MANAGEMENT, AND CIRCULATION (Required by 39 U.S.C. 3685). 1. Title of Publication: Aviation Consumer. 2. Publication No.: 0908-2600. 3. Filing Date: 9/21/15. 4. Issue Frequency: Monthly. 5. No. of Issues Published Annually: 12. 6. Annual Subscription Price: $84.00. 7. Known Office of Publication: 535 Connecticut Ave., Norwalk, CT 06854-1631. Contact person: Greg King, 203-857-3119. 8. Headquarters or General Business Office of the Publisher: Same as above. 9. Publisher: Same as above. Editor: Larry Anglisano, Belvoir Aviation Group, LLC. 535 Connecticut Ave., Norwalk, CT 06854-1631. Managing Editor: Rick Durden, Belvoir Aviation Group, LLC. 535 Connecticut Ave., Norwalk, CT 06854-1631. 10. Owner: Belvoir Media Group, LLC 535 Connecticut Ave., Norwalk, CT 06854-1631. 11. Known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amounts of bonds, mortgages or other securities: None. 13. Title: Aviation Consumer. 14. Issue date for circulation data below: August 2014. 15. Extent and Nature of Circulation (Average No. Copies Each Issue During Preceding 12 Months/ No. Copies of Single Issue Published Nearest to Filing Date): a. Total No. of Copies Printed (10,721/10,200) b. Paid and/or Requested Circulation: 1. Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541 (9,045/8,599). 2. Paid In-County Subscriptions (10/12). 3. Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Non-USPS Paid Distribution (552/522). 4. Other Classes Mailed Through the USPS (0/0). c. Total Paid and/or Requested Circulation (9,608/9,103). d. Free Distribution by Mail: 1. Outside-County as Stated on Form 3541 (788/788). 2. In-County as Stated on Form 3541 (0/0). 3. Other Classes Mailed Through the USPS (0/0). 4. Free Distribution Outside the Mail (158/162). e. Total Free Distribution (946/950). f. Total Distribution (10,554/10,083). g. Copies not Distributed (167/117). h. Total (10,721/10,200). j. Percent Paid and/or Requested Circulation (91.0%/90.6%). 17. I certify that all information furnished on this form is true and complete. Gregory M. King, VP Circulation, 8/19/15.

The Aviation Consumer

Used Pilatus PC-12

(continued from page 31)

experience, my insurance company prescribed the SimCom initial five-day course. Additionally, it required 10 hours of dual instruction and another 40 hours flying with another pilot who had solid PC-12 experience. This mentoring time was really the best training for me. It was low pressure and taught me the real ins and outs of owning and flying the PC-12.

The PC-12 is a large and heavy aircraft that puts a lot of responsibility on a pilot. I don't think it's difficult to fly, but mistakes can be very costly. After 50 hours of flight time I was comfortable traveling the country on my own, but not any sooner.

Moving up to the 47E next-gen PC-12NG was really all about operating the Honeywell Apex flight management system. Things happen quickly in an aircraft with a 280-knot cruise speed. Hand-flying the new plane was even easier than the early model, but being safe and fast with the new glass cockpit did take some learning time. The insurance company was fair and reasonable about the transition, but still required completion of the SimCom seven-day initial course and 10 hours with an instructor. The initial schooling included two solid days of only classroom study on the Honeywell Primus Apex system before even getting into the simulator and pushing buttons.

Honeywell logic is different than the Garmin GNS530s I had in the older PC-12, but I would say that someone with previous Garmin G1000 experience would still be way ahead of a steam gauge-only pilot like me. Glass is wonderful, but you have to really get used to it. We've grown to love the Apex and see a good number of advantages that it has over Garmin's alternative.

As for my wife's learning curve, which would be more like an average pilot quickly moving into a big turboprop, she previously took the SimCom pinch hitter course for our legacy PC-12 each time I went. Susan has been in the front seat of airplanes for the past 27 years, but only as a passenger.

In 2007 she started taking lessons at a feverish pace in a Cessna 172. She soloed just before turning 60, finished her training and got her license. To keep flying and working toward an instrument rating, Susan got her own Socata TB20 Trinidad, which is 250 HP and has retractable landing gear. She took lots of dual instruction when flying over the next year and we made several trips in the Trinidad to help her build time and experience, with the goal of making her a Pilatus pilot someday soon.

Once we started with the PC-12NG training at SimCom, Susan did the full pilot training initial and subsequent refresher courses. This was more for experience because the school could not sign her off as a qualified PC-12 pilot for several years. We worked with our insurance company on following the best path to pilot approval. Susan accumulated about 30 hours of dual with an instructor in our Pilatus and practiced flying as a first officer in the right seat. As she was qualified by the FAA rules, this flight time could be logged. With a final SimCom IFR signoff and an endorsement from a good instructor that she was ready, Susan became a fully insured left seat PC-12NG pilot with about 1100 total flight hours, including 450 complex high performance hours—roughly 100 of which were in the PC-12 with me as the safety pilot. Susan has since done lots more flying with a total time of 1600 hours now.

She has done a number of cross-country flights in the PC-12NG on her own. I frequently just climb in the back of the cabin and let her run the show with an empty right seat. It's proof that good training pays off. I think she is an amazing pilot who is safe and quite competent.

Susan and I hope to continue to fly our Pilatus PC-12NG ourselves for many years to come.

Al Simmons
via email

FEEDBACK WANTED

PIPER ARCHER

For the February 2016 issue of *Aviation Consumer,* our Used Aircraft Guide will be on the Piper Archer. We want to know what it's like to own these planes, how much they cost to operate, maintain and insure and what they're like to fly. If you'd like your airplane to appear in the magazine, send us any photographs (full-size, high-resolution) you'd like to share to the email below. We welcome information on mods, support organizations or any other comments. Send correspondence on the Archer by December 1, 2015, to:

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