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The Aviation Consumer®

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STILL WANT AN ICON A5 AMPHIB?

When I made my products-to-see checklist before launching for Sun 'n Fun last month, Icon's A5 never made it on and it should have. But in my world it was an easy chore to drop because Icon went silent. There had been no press releases in my inbox and little if any industry chatter since the high-profile fatal crash of Roy Halladay last year. So when it dawned upon me while cruising home that Icon wasn't even at Sun 'n Fun, I thought about all of the delivery positions that Icon was to begin filling, and also some of our readers who slapped down deposit money to get on the list for an A5. What's going on at Icon?

To find out, I dialed up Icon's Brian Manning, who told me something I already knew: In 2017, production numbers for the Icon didn't come close to projections. Moving forward, Manning said the company now plans to deliver between six and ten aircraft per month and it completed six in April. For 2018, Icon plans to deliver 150 total. Since the beginning, the company has finished around 20 aircraft total.

"We now have a firm grasp on every element of production, including quality control, and we're ramping back up," Manning told me. Icon's final production headquarters remain in Vacaville, California, while the carbon fiber fabrication for the fuselage is done in Mexico and then trucked to California for assembly. And when it comes to final assembly and customer delivery, Icon's current delivery window has been reduced from years to only six months.

So what about Icon's order book that was filled with thousands of positions to fill? Manning said a large percentage of those orders includes international buyers and Icon is still working through regulations to begin selling in some countries outside of the U.S., including Asia. "There have been position holders who for a variety of reasons—life circumstances, our price increase and other things—have pushed off their deliveries," Manning said. The deposit to get on the delivery list is $2000 and there is no price premium to take delivery within six months. The base price of the 2018 A5 is currently $269,000 and fully loaded models are $389,000—the only configuration currently being produced for sale.

As for the Rotax-powered A5, it's pretty much unchanged for 2018 although Icon has slightly tweaked it. It made changes to the nosegear strut so that it's easier to taxi, the oil cooler has been reworked for better airflow and cooling and the instruments were improved for better visibility. Icon said some buyers are asking about ADS-B Out compliance given the approaching mandate and the company is exploring equipage options, but will be prepared with a solution when the mandate goes into effect.

Icon plans to put the A5 back in the spotlight at both aviation and non-aviation events, including AirVenture this July, plus increase its presence at a variety of other trade shows in the powersports and marine segment. Recall that Icon's target market doesn't really include existing pilots and when I asked how that focus has worked, Icon said that more than 50 percent of people who experienced the aircraft at its flight centers (California and Florida) were new to flying.

The company is doing beta testing on fractional ownership arrangements where an A5 would be managed by Icon, but made available to those not interested in sole ownership. Icon says it has secured financing partners willing to lend money for an A5 at single-digit interest rates.

Manning said the current business plan is to expand Icon's presence around the country, which includes setting up training, service and sales centers for prospects and customers who don't want to go to company headquarters in California. It's also looking for regional flight instructors and sales staff to help support the increase in production. *—Larry Anglisano*

VASHON RANGER

After reading the review of the new Vashon Ranger LSA in the May 2018 issue of *Aviation Consumer* it seems to be an incredible airplane for the cost. In fact, it was at the top of my list for purchase until I ran the numbers.

Probably most important in my decision is that I do not see myself flying alone much of the time. I love to share the joys of flight with friends and family. With a total passenger weight (conservatively) at 165 pounds each for a total of 330 pounds, and a total aircraft useful load of 425 pounds, you're left to choose between fuel or baggage—it's mostly one or the other.

The way I see it, 30 pounds of luggage leaves 9.25 gallons of fuel figuring 7 pounds per gallon. That just isn't much. Leaving the baggage at home bumps the fuel to 13.5 gallons, or less than half of the advertised 27 gallons of usable fuel specification.

Sadly, this is the problem with the FAA regulation for LSAs having the 1320-pound gross weight limitation. Wouldn't it be nice if that could be raised to 1550 or 1650 pounds? Alas, so goes my current dream. I'm now looking elsewhere for a plane.

Philip Vardara
via email

Thank you for your coverage of the new Vashon LSA in your May issue. I've pretty much come to concluding that my days of flying my old Seneca are numbered. I turn 70 years young this coming summer and after selling my business, just don't have the need for filling the seats for regional travel as I once did. But how can I stop flying cold turkey? I can't.

From what I see of the new Vashon Ranger, I can load my bride or a grandkid, an overnight bag or light camping equipment and finally fly without worrying about all the fuel burn of two thirsty turbocharged Continental engines.

Question is, will Vashon be able to stick to the approximate $115,000 price point? I looked at other LSA models, but with the avionics I want the price skyrockets.

Steve Lindquist
Scottsdale, Arizona

We suspect Vashon will stick to its pricing. It understands why some other LSA models have dismal sales and believes it has a solution.

BOSE DUCT TAPE REPAIR

I've owned a Bose A20 headset for just over a couple of years and about 120 flight hours. While cruising in my trusty Piper Cherokee 180 in and out of Vmc with light turbulence, the boom microphone decided to drop down to my neck and wouldn't stay up to my lips where it belonged. I managed to keep it between my lips with pressure and made it work through the approach, landing and taxi to the ramp.

After I shut down I looked it over closely expecting to find a screw adjustment for the boom and couldn't find one. My next step was the internet to search through the A20 manual, which I rapidly found for facts and troubleshooting. There was absolutely no reference to the issue. I got on the phone with the folks at Bose, who answered promptly and informed me that there wasn't any way I could adjust it and said it had to go back to the factory for repair.

They mentioned that other pilots with this issue used duct tape until they could send the headset in. Amazingly, Pensacola Aviation has a full roll of duct tape standing by at the front desk, so I taped it up and flew the rest of the way home with it functioning.

When I called Bose back with the serial number, I was informed that the set was just out of warranty, but before I could say anything, the representative told me that Bose was going to honor the warranty anyway.

That's good business, but I still would prefer fixing it myself.

Steve Bulwicz
via email

FAA 709 CHECKRIDES

Rick Durden's article on FAA 709 remedial checkrides in the April 2018 issue was diplomatic and supportive. I have a bemusing story. Once I was flying a well-restored J3 Cub and the engine failed on takeoff, stalled, spun and the aircraft burned on impact. I was the PIC in the back, sustaining third-degree burns, and my friend who was in the front died.

At the time I had 5000 hours total time, 4000 hours MEL time and since the Cub was gone, it was agreed that the 709 ride would be done in my Cessna T310R. The examiner at the Windsor Locks, Connecticut, FSDO was pleasant and reasonable and said we would do two touch-and-go landings, but when we got to the airplane another FAA inspector eyeballing the airplane told me it was unairworthy because the decal on the emergency exit window didn't match the instructional language ("pull handle, push window") stated in the POH.

I went into the office, grabbed a Post-it note, wrote the precise language and stuck it in place. We flew one touch-and-go and one full-stop landing, the examiner graciously thanked me and I satisfied the 709 ride.

John Rolls
Armonk, New York

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EFIS Market Scan: Some Price Breaks

But all-in upgrades won't be dirt cheap. Aspen's E5 leads for now, and our eyes are laser-focused on BendixKing's XVue and Garmin's G3X Touch.

by Larry Anglisano

CHECKLIST

- We favor Aspen's E5 EFIS for its open architecture, upgradeability and proven reliability.
- Typical EFIS STCs also include the removal of the vacuum system.
- But interfacing with some legacy analog equipment could be a challenge.

Until came the STC'd versions of the Dynon D10A and Garmin G5, primary EFIS upgrades were a stretch for lower budgets. But those days are gone forever thanks to a logical certification process that's shifted from old-school TSO to performance-based STCs.

As we predicted last year for budget autopilots (we covered them in the April 2018 *Aviation Consumer*), we now see growing competition in the EFIS market.

At Sun 'n Fun this past April, BendixKing poked this market when it showed its new XVue Touch EFIS. Meanwhile, Dynon brought its STC'd SkyView HDX and Aspen revealed the under-five-grand Evolution E5 Dual.

Yes, we think it's only a matter of time before Garmin puts tremendous pressure on them all and announces an STC for its experimental G3X Touch—a system offered by no fewer than 17 LSA and kit manufacturers as standard equipment.

This article takes a broader look at the growing market, focusing on models for piston aircraft. We'll cover EFIS upgrades for turbines separately.

FROM TSO TO STC

It's worth a review on how the retrofit EFIS market changed almost overnight, and it's all about certification. The monumental change for the better in certification from TSO to STC turned out to be the break the industry waited years for.

Recall that the trend was started by EAA (Experimental Aircraft Association) and Dynon Avionics when the two teamed to earn an AML-STC for the Dynon D10A EFIS. At the time (two years ago, roughly) the industry marveled that after years of exorbitant pricing from dated certification requirements, low-cost EFIS options that started life in the LSA and experimental market became a reality for certified aircraft.

Garmin didn't sit on its hands and scored an AML-STC for its experimental G5 electronic flight instrument, offering it as a primary mini-PFD and also a version that's a standalone electronic DG/HSI. Both are integral components to Garmin's entry-level GFC500 autopilot.

Garmin, Avidyne and Aspen have proven what we already knew: It's possible to offer a sub-$5000 retrofit EFIS by sidestepping the costly TSO process. There are buyers. Shops tell us that Garmin's G5 rules the roost for the market's lower end, filling the niche for which it was intended. Concerned that sidestepping the age-

Garmin's integrated G3X Touch, lower left, is proven in the LSA and experimental world. An STC for certified applications seems logical, but Garmin hasn't committed. That's the BendixKing XVue Touch in the lower right. The company said an STC is pending for this summer.

old TSO process might compromise reliability? Worry not—there's still a boatload of effort that goes into an STC and certification via ASTM standards. The cost savings is partly made up from less paperwork.

Some credit goes to the FAR Part 23 rewrite for more logical testing methods, but it's also the FAA's shift in mentality to performance-based (STC) certification from one that was prescriptive (TSO) based that saves money.

"The old way of certifying avionics worked, but it wasn't allowing for lower-cost technology in the marketplace," said Aspen Avionics President and CEO John Uczekaj. Aspen, a company with huge regulatory success, recently announced the budget-based E5 Dual EFIS, which is certified as a primary, non-TSO EFIS.

There are no free passes under the STC process because when it comes to hardware, manufacturers still need to prove that a product will reliably perform in a wide variety of temperature and other environmental conditions.

"I still have to prove a product's reliability, but the software-driven nature of today's equipment means I can now use a performance-based process without having to generate reams of paper that is part of the old TSO process," Uczekaj told us.

And the resulting lower-cost solutions made possible by this shift in certification effort have, in our view, set a new market expectation by which all retrofit EFIS systems will be judged. Read on for a rundown of the systems designed to be the primary EFIS, with navigation display and autopilot approach functionality. These aren't intended for backup.

Dynon's certified HDX, top photo, includes the company's D10A EFIS for backup, plus the Dynon autopilot system. Aspen's scaled-back E5 Dual PFD, bottom, sacrifices an electronic HSI, base map and flight director guidance.

BENDIXKING XVUE TOUCH

The market waits for BendixKing to earn certification for its KI300 retrofit electronic attitude display, which was announced a few years ago. It's designed to replace the mechanical KI256 flight director gyro that's integral to a wide range of BendixKing and King autopilots. We're told that final certification of the KI300 is still in the works and is expected in June 2018. The company has slipped on its projections more than once.

But last month at Sun 'n Fun BendixKing was quietly showing the XVue Touch integrated flight deck. Some media organizations didn't even learn of the product until the show was over. For a product like this, we would have expected advance notice with a release embargo and more hoopla at the show.

The XVue is designed as a replacement for the entire six-pack instrument arrangement. The system doesn't have an STC, so the first version (available now) is aimed at experimental aircraft.

Priced at $5499 without certification—and $12,495 when it eventually has a broad AML-STC—the XVue Touch's specs are what we think the typical big-screen glass buyer expects. For starters, that's a high-end display. The XVue's graphics are indeed high-resolution (near 4K) on a 10.1-inch WUXGA color touch display with split-screen capability. The coated glass used on the display is anti-scratch, anti-glare and anti-smudge. The tech comes from the Honeywell division and was born from hardware used in the F-16 fighter aircraft's avionics, according to BendixKing.

Displaying a full-screen PFD, an MFD and a combination of both, the 7.59-pound XVue Touch display has Honeywell's SmartView synthetic vision and a wide 80-degree viewing angle. The MFD has a moving map, VFR and IFR charting and can display ADS-B weather and traffic data. The system is designed with a shallow feature set, as all critical functions can be accessed in fewer than two touches.

The XVue is primarily touchscreen and uses a 1.48 by 6.25 by 3.67 inch control panel housing four rotary knobs for commonly used functions like setting the heading bug (the system has third-party autopilot compatibility), setting the baro, course select and altitude bug. It also has built-in Wi-Fi (for database and software loads) and a USB-C port. The touch display has no bezel knobs or but-

Big-screen EFIS upgrades are an opportunity to finally replace the factory engine gauges in favor of a digital interface, with smart monitoring and leaning assistance. Adding sensors to the engine will be a sizable chore and a big invoice. You'll still need an external IFR GPS navigator with any retrofit EFIS system. An Avidyne IFD540 (bottom image) will add every bit of $12,000 to a package.

tons. Flight data is derived from a solid-state ADAHRS, of course, plus a magnetometer and OAT sensor.

BendixKing said it would work on arranging a flight trial and we'll provide an inflight report if it does.

DYNON CERTIFIED

The Dynon Avionics Skyview HDX suite was developed for the experimental market, but at press time Dynon has secured an AML-STC (and PMA) for Cessna 172 Skyhawk models—from the 172F through the 172S. Dynon said it is actively seeking additional STCs for single- and twin-engine applications.

We covered the Dynon Certified HDX system in the September 2017 issue of *Aviation Consumer*. As a recap, the Skyview HDX is partly self-contained in a single 10.32-inch PFD/MFD combo, which will require rework of the Cessna's pilot's instrument panel. Since the STC covers the removal of the aircraft's vacuum system, installation should tidy things up behind the panel. Remove all of the round-gauge flight instruments—including the vacuum system plumbing—and put the 3-inch-deep display in place, although expect some sheet metal work to support the transformation.

While the Skyview HDX has a built-in GPS, full IFR approach capability comes from a remote third-party IFR navigator. Avidyne's IFD500 and 400-series navigators and Garmin's GTN and GNS-series navigators are recognized interfaces, but aren't included.

Aside from the IFR GPS (the HDX has a VFR GPS built in), think of the Dynon suite as a soup-to-nuts system. It has Dynon's approach-capable autopilot, an angle-of-attack system, engine instrumentation system, a 2020 mandate-compliant ADS-B Out transponder (plus ADS-B In) and synthetic vision. It won't work with third-party autopilots, at least initially, and it won't interface with analog navcomm gear.

At press time, the first field installations are underway and are available through US Sport Aircraft and Thrust Flight in Texas and Merrill Field Instruments in Alaska.

The Dynon Certified HDX requires the purchase of the STC ($2000), and the hardware is priced the same as it is for the experimental version. Dynon's Cessna test bed we saw at recent shows was equipped with roughly $16,000 of Dynon gear, and the company is sticking to its projections that fly-away pricing will be in the mid-$20,000 range, but that could be higher depending on the aircraft and its configuration.

WHAT WILL GARMIN DO?

Recall that late last year Garmin introduced its next-generation G500 TXi-series retrofit PFD/MFD products. Currently approved via TSO with an AML-STC, these are redesigned touchscreen displays that replace the G500/600. While the TXi is available in a 7-inch configuration, Garmin says the 10-inch G500 TXi is the most common because it can display engine data without a dedicated screen that's required in 7-inch versions.

The 10-inch TXi with a four-cylinder EIS and SVT synthetic vision is $23,635. More than one shop told us that a typical installation might take two weeks of shop labor, or roughly $8000. Added up, the typical $30,000 fly-away price doesn't include an IFR GPS or an autopilot.

Worth mentioning is that this single-screen (non-reversionary) setup still requires keeping standby flight instruments. This can be round-gauge altimeter, airspeed and attitude indicators, or Mid-Continent's SAM or L3 Aviation's ESI500 backup EFIS displays.

If these aren't the low prices you'd expect in the current market, the TXi was developed before certification efforts shifted from TSO to STC. Still, Garmin sees a place for the TXi series and that's in higher-valued airframes. For under $3000, the smaller G5 fills a niche that Garmin says is working just fine, and shops say they install a lot of them.

The G5 is required in the GFC500 autopilot interface, but using it for a legal backup for a TXi might require additional regulatory approvals. In the experimental world, the G5 is a belt-and-suspender backup to the G3X Touch and we think it should be included it in the TXi STC. In our view, the idea of a big-screen EFIS retrofit is to lose the round gauges.

Garmin was noncommittal when we asked if it plans to pursue an STC for the experimental G3X Touch, which has a starting price of $3895 for the version with a 10.6-inch display. Garmin's senior business development manager, Bill Stone, is watching closely, but says the budget EFIS market has yet to establish itself, but we think it's already defined: low cost.

But we agree with Stone when he reiterated that there's more to product

development than sidestepping TSO certification. Even if the G3X Touch was available in an STC'd version, interfacing it in a wide variety of aircraft that have federated radio stacks (that's multiple brands and multiple vintages of equipment) will require sizable rework—which equates to purchasing newer equipment, including IFR GPS navigators. As we said, that's a caveat with Dynon's HDX, too.

"In all of our TSO-certified products—from the new TXi back to the vintage GNS navigators—we've incorporated a tremendous amount of interface capability so that they can drop into an airplane that has a hodgepodge of existing avionics," he told us. Stone is making reference to the technical reality of wiring into both analog and digital equipment, as the GNS and GTN products do.

We eyeballed the external equipment compatibility list for Garmin's TXi displays and indeed saw a deep interface potential. This includes everything from vintage King KX155 navcomm radios to third-party DME systems and a long list of approved autopilot interfaces—from ARC/Cessna to Century models.

The G3X Touch, with 10.6-inch landscape and 7-inch portrait display configurations, is limited to Garmin's own G3X embedded autopilot and GFC/GNS digital navigators and navcomm equipment. It won't work with analog receivers, but certainly Garmin knows how to make it play. It's been building converters for years.

When asked why it doesn't come standard with analog inputs, Stone pointed out that the G3X Touch is primarily sold in the kit market, where the airplane is built around the avionics. Same with OEM LSA applications. We are in a modern digital age, after all.

Engine data is interfaced with the GEA24 EIS module. One module can support up to six cylinders (two modules are required for a second engine); it works with turbines, radials and has a CAN bus interface for FADEC engines, including the Rotax 912iS.

WHAT ASPEN HAS ALREADY DONE

Other than being capable of playing with analog and digital third-party avionics, Aspen's new E5 Dual EFI (dual means attitude and heading) was launched with an interface to TruTrak's Vizion autopilot. It also works with most legacy autopilots for heading command and nav approach coupling. The base E5 is $4995, but add $1000 for the external ACU to interface with legacy radios.

The image at the right is Garmin's fully TSO'd G600TXi with a 10-inch primary display and 7-inch EIS engine display. Priced well north of $20,000, the focus is higher-valued airframes.

On the surface the E5 looks like an Aspen PFD always has, but it has brighter glass and faster processing power. The display is a 6-inch diagonal TFT Active Matrix LCD with 400 by 760 pixel count. The Evolution's drop-in form factor is partly the reason for Aspen's market success and the E5 is no different.

The E5 will typically be installed in the center of the six-pack arrangement of flight instruments and into the existing holes. There's no cutting of the panel to make it fit, the STC approval includes the removal of the vacuum system and a backup attitude indicator isn't required. Like the rest of the Evolution line, the self-contained rechargeable lithium-ion external backup battery can power the display for up to two hours.

You can also upgrade it, turning it into a 1000 Pro PFD and unlocking some major EFIS display functions that we think buyers might want as standard. That's autopilot flight director, a base map and more importantly, an EHSI. The $6000 price is a tradeoff, although the E5 has a basic nav display. In its stock non-EHSI arrangement, the CDI and VDI data are displayed on the attitude portion of the screen, while a CDI data field sits on the lower portion of the display. No course control or flight plan overlay.

As a comparison, Aspen's TSO'd 1000 Pro PFD is priced at $10,995, and around $16,000 installed.

THE TAKEAWAY

Our conclusion is that the market fully expects manufacturers to offer lower-cost EFIS displays by pursuing wide-reaching STCs, just as Aspen has done with its E5 display. We favor it because it hits what we think is the market sweet spot. When paired with TruTrak's Vizion autopilot, fly-away pricing that's well under $15,000 is a reality. Garmin's G5 comes close but with a smaller display than all of the other brands, that doesn't include an IFR navigator. This will add $10,000 and more to any EFIS installation—for a single GPS.

As for a timely AML-STC certification of BendixKing's XVue Touch suite, we hope the company pulls it off because that stirs competition. But that doesn't necessarily mean an instant success. Our sense is the shop network is jaded after multiple BendixKing products missed the mark on certification deadline. This includes the KSN770 (now certified, but still not matured) and the KI300, which is still awaiting approval. In our view, a huge part of the XVue's success rides on BendixKing's ability to market it, to both end customers and shops.

As for Dynon, its current AML-STC is limited to the Cessna 172, which is a good start, but still misses a large chunk of the market. Moreover, we think its fair price would be even more palatable if the STC were adjusted to not require the autopilot.

Last, we think there are buyers for an STC'd G3X Touch, although we can't say in what numbers. For any sizable sales volume, we think it needs to be priced well south of $8,000 and work with third-party autopilots and vintage avionics. If it was, that would strategically place the G3X Touch in the mid-priced category, in between the flagship TXi and entry-level G5.

Home Flight Sims: FlyThisSim Is A Top Pick

High tech has brought sophisticated capability to desktop flight simulators at surprisingly low prices. Buying one for recurrent training may make sense.

by Rick Durden

Flight simulators of various sorts have been around since the Wright brothers started their flight school. They were, and are, based on the premise that an airplane cockpit is a lousy classroom, so learning what you can about flying an airplane in a device on the ground will help you learn faster when in the airplane itself—reducing training costs.

In the last several years the ability of simulators to replicate aircraft handling, instrument panels, avionics and view out of the window (OTW) has improved almost logarithmically as costs have dropped. Visuals that were once only available in multimillion-dollar simulators are now available as turnkey, ready to operate desktop units at prices under $10,000. We think that the price of simulators that emulate specific types of airplanes with reasonable accuracy has dropped to the point that buying a home-based sim that is sophisticated enough to use to meet the FARs for recency of flight experience to stay current on your instrument rating is financially feasible.

During our survey we observed that virtual reality technology is moving into sophisticated flight simulation. While it's still early times, that technology has the potential for further driving down the cost of simulators while ramping up realism.

X-PLANE 11

While we focused our survey on turnkey units, we felt it appropriate to at least mention the DIY flight simulator X-Plane (www.x-plane.com) because of its capabilities. It has become one of the software platforms of choice for flight simulator developers as well for new aircraft design. The most recent software—X-Plane 11—for individual flight simulation use may be purchased for $59.99 and downloaded in about two hours. Using a $20 gaming joystick, the user can have a basic flight simulator up and running soon after the download is complete. X-Plane 11 can also be purchased on DVD or on the Steam platform.

From the basic installation a user can purchase a vast array of peripherals including sticks, yokes, rudders and monitors as well as buy or build cockpits to create what we consider to be astonishingly sophisticated simulators that do a good job of replicating a specific airplane—it just takes time, money and technical know-how.

While even the most involved simulator built by an X-Plane user cannot be used for credit toward recency of experience by an instrument-rated pilot, even the most basic laptop and joystick application of the software is so good that many instrument pilots and students use it to help hone their skills.

In our opinion, X-Plane is the most realistic of the various downloadable laptop flight simulators that are or have been on the market over the last few years. When you deflect the flaps in a Cessna 182 the simulated airplane pitches up, just like the real one. The visuals are excellent and various weather conditions can be simulated easily.

REDBIRD JAY

Developed by the simulator company that brought motion to the general aviation masses, the Redbird (www.simulators.redbirdflight.com) JAY is a metal-chassis desktop unit that uses a 27-inch LCD monitor to present an instrument panel and out of the window view. For $2595, the system includes the monitor, speakers, computer, keyboard with shortcut commands, flight controls (no rudders) and a one-year warranty (with a 30-day money-back guarantee). The metal yoke is designed with travel distances similar to Cessna

The desktop Redbird JAY boasts a metal chassis and yoke with deflection distances similar to Cessna and Piper singles.

ELITE's TS-1000 desktop AATD, top, has a worldwide nav database. FlyThisSim's TouchTrainer SD, middle, is a BATD with 45 different aircraft packages. X-Plane 11, bottom, provides an inexpensive, desktop simulator that can be expanded and customized by the user.

and Piper singles. The throttle quadrant includes a throttle and mixture control and is similar to that used on the Piper fixed-pitch prop single-engine line. The panel to which the throttle quadrant and yoke are affixed includes a flap switch. The remainder of the switches and controls appear on the monitor and are activated via keyboard commands.

No versions of the Jay are certified by the FAA for credit for flight time.

An upgraded version of the JAY, called the JAY Velocity, is offered for $3995. With more robust internal components, heavy-duty flight controls and what Redbird refers to as "upgraded computing power for high reliability," it is targeted at users in more demanding environments such as schools and museums.

The Jay is powered by Lockheed Prepar3D ("prepared") software—an evolution of Microsoft's FSX, so most plug-ins, aircraft and communities designed for FSX will work on a JAY. The system allows for free flight mode where the user selects the aircraft and conditions and scenario mode where the user can load a scenario and fly it. Scenarios vary from a simple flight involving a challenge to be met to a complex flight with multiple outcomes.

ELITE

ELITE Simulation Solutions (www.flyelite.com) has been making IFR simulation software since 1987. It offers a number of desktop and full cockpit simulators that are suitable for training and recurrent training at home.

We considered two of its models as viable options for a sophisticated home simulator.

The PI-135 desktop, a BATD, retails for $8995. It has one monitor, an avionics tower including a Garmin GNS 430W emulator, an ELITE computer configured with the system's software and iPad connectivity for various aviation apps.

Twelve different aircraft models can be simulated. We noted that the OTW visuals were among the most limited of the sims we surveyed.

We were more impressed with the TS-1000 BATD series. Starting at $9,195, they are desktop sims that emulate the Garmin G1000 panel on nine different piston-engine airplanes. Each has a touchscreen monitor for the panel and separate 43-inch monitor for the OTW visuals. The worldwide navigation database is updatable and includes departure and arrival procedures.

FLYTHISSIM

FlyThisSim (www.flythissim.com) was formed in 2006 with the intention of providing reasonably priced software simulations of Avidyne, Garmin and other avionics for inclusion into flight simulators targeted at general aviation pilots. Cofounder Carl Suttle came from the military flight simulator world and first

CAN I LOG MY TIME IN THE SIM?

There is a fair amount of confusion regarding whether a pilot can log time in a simulator toward a rating and/or recent experience required of an instrument-rated pilot to file and fly IFR. Put simply, the most basic unit in which a pilot can receive credit toward a rating or instrument currency is an Aviation Training Device (ATD).

Practicing or training using a unit that is not capable of meeting the FAA standard of an ATD will help a pilot improve and/or maintain skills, but the time cannot be "logged," that is, credited toward a rating or recent instrument experience.

There are two categories of ATDs defined by the FAA in Advisory Circular AC 61-136A: Basic (BATD) and Advanced (AATD). An ATD is approved by the FAA after a request from the original manufacturer and sold as a complete product.

A BATD is what we think of as an entry-level, FAA-certified sim. It must have certain physical controls (not a computer keyboard, mouse and gaming joystick) and may have touchscreens. The physical controls must represent a class of aircraft with reasonable accuracy and effect in operation. The controls and the way the simulated aircraft flies do not have to accurately match any specific aircraft—although, with technology and software advances, many do a remarkably good job.

BATDs are not required to have an "Out the Window" (OTW) visual capability. However, all of the ones we are aware of have at least a limited OTW capability, something we think is important. As we researched this article, we found that 80 percent of how our bodies perceive motion is through vision. Accordingly, because the OTW capabilities of what we consider to be home flight simulators have skyrocketed in recent years, we are of the opinion that some of the BATDs on the market are excellent trainers for VFR operations, without the need for them to be on a motion base.

An AATD has to meet all of the BATD requirements and have what the FAA refers to as a realistic cockpit. This doesn't mean a full enclosure for the pilot, but it does mean correctly sized and positioned controls and instruments and real switches, knobs and levers in correct arrangements and the correct distance from the pilot. The simulator has to be capable of performing all of the emergency procedures outlined by checklist in the aircraft's POH.

There must be a digital avionics panel and a realistic GPS navigator with moving map to meet AATD requirements. At least a two-axis autopilot is required. Even the seat must be realistic for the kind of aircraft represented. An OTW display that is capable of representing the virtual environment through which the airplane is flying with realistic visual cues for day and night VFR as well as IFR conditions is required. Visibility and ceiling must be adjustable.

Time flying an ATD, either BATD or AATD, is time flying an ATD—not an airplane. A pilot cannot log it as airplane-flying time or PIC time. However, it can be used as credit for a portion of the time required for the private and instrument ratings. For the instrument rating, it's 10 hours in a BATD and 20 hours in an AATD (FAR 61.65(i)).

FAR 61.57(c) sets out the requirements for recent experience to file and fly IFR. Subsection (3) refers to the use of an ATD providing: "Within the 2 calendar months preceding the month of the flight, that person performed and logged at least the following tasks, iterations and time in an aviation training device and has performed the following—" and goes on to specify three hours of instrument experience; holding procedures and tasks; six instrument approaches; two unusual attitude recoveries (with conditions); and interception and tracking courses through the use of navigational electronic systems.

The downside? FAR 61.51(g)(4) does require that for the BATD or AATD time to count for recent experience it has to be with an instructor and an appropriate logbook entry made.

That's a significant inconvenience for a pilot who has an airplane and an ATD unless he or she is lucky enough to be married to a CFII or have a CFII as a neighbor—although it appears that with appropriate equipment, the instructor can supervise the session from a remote site. Frankly, we think that the requirement for an instructor is stupid, arbitrary and contrary to any goal of enhancing safety of flight. After all, an instrument pilot with an IFR-clueless safety pilot who is a private pilot can log time under the hood in flight that counts toward recent instrument flight time.

The FAA lets that pilot choreograph his own recurrent training program when in an airplane—it makes no sense to us that the same pilot cannot do so in an ATD that allows her to reposition to shoot multiple approaches in a short time and simulate emergencies that it would be foolish to do in the airplane. We're hoping the reg is changed.

Nevertheless, even if the regs remain as they are, we think a personal flight simulator of ATD capabilities makes sense economically and practically for a pilot who wants to maintain a high level of instrument competency.

FlyThisSim's TouchScreen VM, top, has some of the best visuals we've seen. One-G Simulation's Foundation series includes a single-engine Cessna AATD, middle. Its Robinson R44 simulator, bottom, makes use of virtual reality technology rather than computer monitors for the visuals.

focused on designing simulators for general aviation after buying a Cirrus and being concerned about the line's early accident rate.

All FlyThisSim TouchTrainer models are BATDs. The VX model is used by the Cirrus Owners and Pilots Association (COPA) for its proficiency training programs. Each TouchTrainer model is designed so that it can be upgraded to any of the more capable products in the line. They are also designed to specifically duplicate individual aircraft so that users can replicate aircraft they own—something we consider of significant value.

All TouchTrainer models connect with Electronic Flight Bags (EFB) on iPads. They will feed real-time data, including weather, from ForeFlight.

At $5400, the TouchTrainer SD is an entry-level BATD that is reconfigurable and upgradeable. It has two touchscreens and aircraft-specific instrumentation for 45 different aircraft packages and a 45-degree-wide out of the window view that can be used for taxi, takeoff and landing. It has two 24-inch by 10-inch touchscreens. The autopilot allows the same button selection as on the replicated aircraft.

The next step up in the TouchTrainer line, the VX, is also a desktop BATD but includes a 100-degree-wide visual system. It consists of five screens—three 24-inch, high-definition monitors for visuals and two for instrumentation. According to personnel at FlyThisSim, a continuous horizon is created in the visual display by accounting for the thickness of the monitor bezels, so that they come across as window posts in the aircraft rather than blocking a substantial portion of the out of the window view. Priced at $8100, the VX can simulate more than 125 individual aircraft, avionics, autopilot and systems combinations.

FlyThisSim's top of the line desktop BATD is the TouchTrainer VM. Priced at $12,500, the VM can host all of the more than 400 aircraft FlyThisSim simulates. It has two touchscreens devoted to aircraft-specific instrumentation and a 100-degree-wide by 70-degree-deep visual system on three 55-inch HD monitors, giving 32 square feet of visual display.

ONE-G SIMULATION

Started in 2010 by Xylon Saltzman, a flight instructor and charter pilot who was unhappy with the level of access to high-fidelity simulators in general aviation, one-G Simulation (www.flyone-g.com) makes a series of AATDs targeted at flight schools. They replicate four Cessna singles, the Beech Bonanza and Baron, Socata TBM 700, Pilatus PC-12 and soon, the Robinson R-44.

We were not going to include one-G simulators in a survey of ones likely to be purchased for personal use until we came across a feature that changed our perspective somewhat—the one-G Access program. One-G will place a Foundation simulator in a qualifying flight school on a pay per use basis. Aircraft owners who want an AATD-level simulator have worked with their local flight schools to get a Foundation simulator through the Access program. It allows the flight school to have a simulator on a pay per use basis rather than for the base price of $30,000, which benefits both the school and the person who wanted a simulator to start with—he or she becomes a paying customer of the flight school and has access to an AATD for an hourly rate rather than buying one outright.

The Foundation sim is designed to replicate the Cessna 172, 172RG, 182 and 182RG. It offers wireless connectivity to ForeFlight, WingX Pro and FlyQ apps and the 1G-650 GPS emulator (Garmin GTN 650) is

REDBIRD GIFT: VIRTUAL FLIGHT INSTRUCTOR

About a year ago we were introduced to flight training using a simulator and artificial intelligence as a method of exposing a student pilot to a flight maneuver and then having her practice it with real-time coaching and immediate feedback from the simulator—just as if an instructor were there. It was developed by Redbird for flight school use and is referred to as Guided Independent Flight Training (GIFT). We think that has incredible potential for enhancing the quality of flight training toward ratings and recurrent training for instrument pilots—while cutting the cost.

Thus far GIFT is only set up for training toward the private pilot certificate and is usable only on a Redbird AATD; however, Redbird told us that it expects to release the instrument rating version this year. Because, in our opinion, the technology and training approach reflected in GIFT have so much potential for simulator-based training and recurrent training, especially when paired with the use of virtual reality, we think that it will trickle down to at-home simulator systems. We recommend that pilots who have any interest in the use of home simulators for training or recurrent training keep an eye on what happens with GIFT, and competing systems as they develop. Because of the quality of the feedback to the pilot for each maneuver, we think that should GIFT be developed for recurrent instrument training—notably that required to maintain currency for the purpose of filing and flying IFR—that it will help support a change to the regs that currently require that an instructor supervise simulator recurrent training and make a logbook entry.

Accordingly, we'll go through a brief description of GIFT in its present form.

It is not a standalone training program. It was designed to be a supplement to any private pilot flight training program. It does so by being focused strictly on learning to fly the 33 maneuvers that must be mastered to become a private pilot.

After going through a number of the individual maneuver modules and their written and video introduction to the specific maneuver, flying the maneuver in the simulator while receiving real-time coaching from the software and then having a detailed score generated within a few seconds, we came away impressed.

For $249, a student purchases a license to use the Redbird GIFT software in any Redbird simulator in which GIFT is installed. The license has no expiration or termination date—once it's purchased and operative, the student can use and review the text and video of the private pilot GIFT modules on an internet-connected device and practice flying the maneuvers in a Redbird sim.

GIFT modules exist to introduce students to the maneuvers in a distraction-free atmosphere. There is no holding short for takeoff with the Hobbs running—the student tells the simulator to start a particular module and whambo, the airplane is in flight, in position and configured to start the maneuver.

Flying most of the maneuvers takes less than five minutes and, once complete, the simulator pauses—and stops running up cost. The system generates an objective evaluation of the student's performance on the maneuver. It appears graphically—charting, for example, indicated airspeed, altitude and heading—and textually, comparing the student's performance to the ideal, and providing a percentage grade. 80 is passing, 90 is very good. Between 95 and 100 the scale becomes roughly exponential, making it extremely difficult to score 100—something Redbird learned from computer gaming as it has proven to be a powerful motivator. In one of our exercises, we kept the airspeed within 0.2 knots of what was called for and scored 99 percent, not 100.

The evaluation for each maneuver is kept on the student's account on Redbird Landing, a non-sales site that stores the student's GIFT module information. The student can share his scores with his instructor, to help tailor subsequent instruction in the maneuver in the airplane.

As we said above, we think the potential for this approach for training and recurrent training on home-based flight simulators is impressive. We'll be watching.

standard equipment. Access to the one-G Portal is included with the Foundation simulator. With appropriate equipment installed, the Portal allows an instructor to work with the user remotely and meet the requirements of having an instructor present to credit the simulator time toward a rating or recent experience for an instrument-rated pilot.

CONCLUSION

We think that—whether simulator hours can be logged or not—an hour in an ATD-level simulator giving oneself an IFR workout is more valuable from a safety of flight standpoint than an hour in the airplane under the hood with a safety pilot. Also, at a minimum of $150 per hour to operate an IFR airplane, using a simulator as often as possible makes good financial sense as well.

While we were impressed by the sims we surveyed, we think the TouchTrainer SD—a BATD with the ability to replicate specific airplanes—provides the most bang for the buck.

For a non-ATD, turnkey sim, we like the Redbird JAY.

Flight Design CTLSi GT: Refined Integration

A three-screen Dynon EFIS suite, 120-knot cruising speed and a $185,000 price tag put the 2018 CTLSi GT at the top of the LSA food chain.

by Larry Anglisano

If you're still hanging onto the notion that LSAs aren't real airplanes then refocus and put your eyeballs on the 2018 CTLSi GT. Before even flying one, it was easy for me to affirm that it is indeed a credible, upscale, go-places LSA traveler with combined systems that make it one of the most modern piston singles on the market.

That's a bold assertion and there's no comparing it to something like a new Cirrus for speed and all-weather utility. Not close. But with a new three-screen EFIS system that's highly integrated with the engine and airframe, plus a whole-airplane parachute, the only thing that might stop a qualified buyer from putting one in the hangar is the silly legalities of not being able to fly it in IMC.

A FRESH START

Flight Design went into receivership in 2016 after getting in trouble with non-payment from Asian business deals. While the Ukrainian factory where Flight Design aircraft are made never shut down, last summer the company was bought by the German firm LiftAir, a subsidiary of the Lindig Group, which also owns the gyrocopter company Rotorvox.

Now called Flight Design general aviation GmbH, production is ramping back up and according to Tom Peghiny at U.S.-based Flight Design USA (the brand's regional center for the entire North and South Americas), the factory plans to build roughly six airplanes per month. When I visited Flight Design USA's facility in Woodstock, Connecticut, early this spring a spanking new 2018 CTLSi GT had just been issued an airworthiness certificate and was headed for Sun 'n Fun.

And it joins a Flight Design fleet that is nothing to sneeze at. There are more than 1900 CT aircraft flying since 1997. The first was delivered to the U.S. in 2003, where there are now more than 400.

FLIGHT CONTROLS, CABIN

Unchanged from even the earliest CT, the latest two-seat CTLSi GT (the GT means Grand Touring edition) has primarily composite construction. It's arranged as a high-wing monoplane with removable cantilevered wings and tricycle landing gear.

The airplane has an all-moving horizontal tail (a stabilator with a push/pull cable) and to improve control feel, the stabilizer has an anti-servo tab attached to the tail with a composite membrane. There's electric pitch trim via a command switch on the center console, but I think it needs to be on the control stick. The aircraft has traditional nosewheel steering via push rods, while a spring-loaded centering device holds the pedals in a neutral position in flight.

The ailerons are activated via push rods that run from the control sticks through a tunnel to a mixer located in the baggage compartment. In the mixer, the aileron input is coupled with the flap setting, and when extended, the ailerons follow the flaps to a preset limit. The airplane has winglets, and the ailerons have return springs, which combined contribute to better harmonic control feel at low speeds. There's also aileron and rudder trim.

The aircraft has electric flaps, from -6 degrees for fast cruise flight to 30 degrees when fully extended. The flap indication system is smart; the position indicator flashes when the flaps are moving to the set position and then the indicator shows the current flap setting. There's also an internal load-limiting device that prevents flap extension above 80 knots.

Flight Design did a good job designing the wide gullwing doors for easy entry into the wide cabin with

CHECKLIST

- The fuel-efficient Rotax 912iS Sport is a perfect match for the CTLSi's airframe.
- Dynon's highly integrated SkyView HDX avionics add to the airplane's ergos and capability.
- But despite the capable avionics, the regs say you can't fly the CTLSi in IMC.

With leather seating, lots of headroom and 50 inches of width, the CTLSi GT cabin is a comfy dwelling. Dynon's three-screen HDX touchscreen avionics, bottom, dominate the panel.

high-quality leather seating and stylish trim. Owners stepping down from high-end rides will be pleasantly surprised when sliding into the CTLSi GT for the first time. The cabin is nearly 50 inches wide—which is wider than a Bonanza and Skylane cabin, among others. There's plenty of headroom.

You won't be hauling bicycles in a CTLSi, but you can bring small stuff along. There are two 55-pound-capacity baggage compartments behind the two front seats, not accessible from the cabin but through hatches on the side of the aircraft. I stuffed in a large backpack and some camera gear and there was space left over. A good-sized duffle for overnight trips wouldn't be a problem. There are also hinged storage compartments in the floor, just forward of each seat.

There's a lot of glass on the airplane, adding to a spacious feeling and offering good outside visibility that betters other high-wing aircraft. Aside from large door windows and two rear windows that help with rearward vision, there are also skylights, which brighten the cabin even more.

The CTLSi is equipped standard with a BRS-6 1350 full-airplane parachute. The repack/recertification interval is six years and typically costs around $1600 including labor and freight. All exterior lighting is LED.

DYNON HDX AVIONICS

The big news for the 2018 model is Dynon's SkyView HDX integrated avionics, which also has Dynon's integrated two-axis autopilot with Level mode and a controlled 180-degree turn function intended to fly the airplane out of inadvertent IMC. It's not the first time the SkyView and an autopilot were used in a Flight Design, but the GT is the first model to get three integrated HDX screens. To say they dominate the cabin is an understatement.

Equipped with dual independent ADAHRS, synthetic vision and wireless connectivity to tablets running ForeFlight, there are two high-definition 10-inch touch displays and another 7-inch display in the center of the panel that functions as an MFD and as an engine management system, or EMS. This is full integration, with all displays connected over the network and sharing the data for reversionary backup, plus two of the displays are backed up by 30-minute emergency batteries. For redundancy, there are two pitot tubes. There's only one EMS module, however, so if it fails you're on your own for monitoring the aircraft's Rotax 912iS Sport engine.

The aircraft has Dynon's SV-X83 comm radio, built-in VFR GPS and the SV-2S intercom, but there's an option for IFR GPS navigators (including Avidyne's IFD440) for those wanting to do instrument training or fly instrument approaches under VFR conditions. Flight Design has the 2020 ADS-B mandate covered with Dynon's SV-261 Mode S ADS-B transponder, plus there's full ADS-B traffic and weather capability through Dynon's SV-472 dual-band ADS-B In receiver.

FLYING IT

The aircraft I flew had an empty weight of 838 pounds and with two of us and 132 pounds (4.4 hours endurance) of fuel aboard the takeoff weight

YouTube See a flight trial video of the CTLSi GT at http://tinyurl.com/j95ht2a.

was 1310 pounds. The usable fuel is 34 usable gallons (Ethanol blended autogas is approved) and the fuel selector for left, right and both tanks is located on the rear panel just behind the pilot's right shoulder. There's a header tank in the baggage area that holds 1.32 gallons of reserve fuel.

Traveling? The useful load is around 550 pounds and the performance chart shows eight hours of endurance (or 832 NM at 104 knots) at a 5000-RPM power setting, or 4.2 GPH.

The aircraft doesn't have toe brakes so out of the chocks it's one hand on the large brake handle (the airplane has MATCO brakes and wheels), which sits just to the right of the throttle lever. I found the airplane easy to taxi with little need for power adjustments.

Cabin ventilation is good, with sliding windows and small fresh air scoops on each door. There are warm air nozzles for cabin heat, generated in a shroud that guides fresh air from the intake at the middle of the lower cowling around the muffler. There's a CO detector installed as standard.

The 100-HP, dual-channel ECU Rotax 912iS Sport is nearly a perfect match for the CTLSi GT, in my view. It's mated to a ground-adjustable Neuform three-blade composite propeller. Full-power takeoff yielded roughly 5500 RPM and normal takeoffs are made with the flaps clean, and with 15 degrees on shorter runways.

The takeoff roll is short and the first time you fly a CTLSi you'll need to establish the correct reference point out the windshield. With the tapered nose, it's easy to take off and land with a sideslip as you look to the center of the windshield, but that's not going to work. The correct sight picture is established by drawing a vertical line upward from the inboard end of the pilot's left rudder pedal.

Rotation speed comes at around 46 knots and once rolling, you'll want slight back pressure on the stick to unload the nosewheel. Out of a Cirrus that pretty much flies itself off the runway, on my first try I slightly overrotated and the AoA let me know it. I had it perfectly dialed in the second try, with just enough back pressure to smoothly get the airplane flying and into the climb. And climb it does.

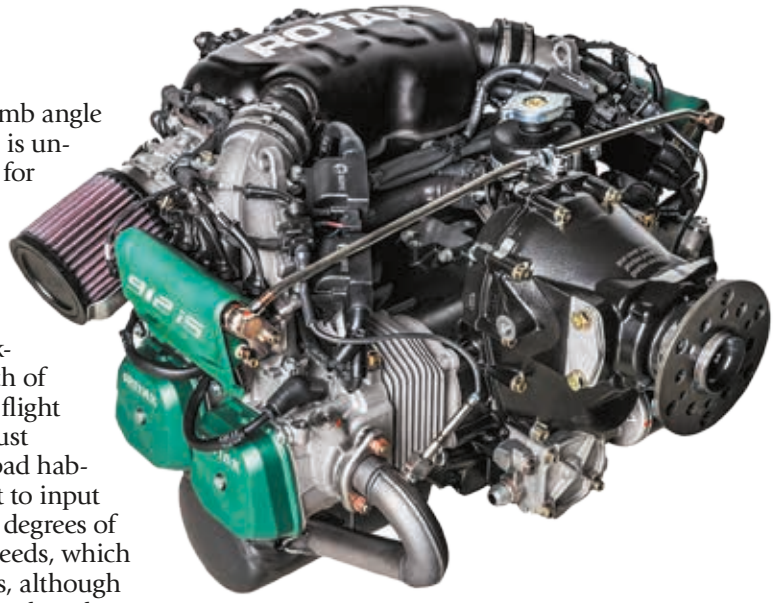
With flaps at 0 degrees and pitched for around 57 knots, I saw 1100 FPM—not bad for 100 horsepower. The maximum climb angle is 52 knots, which is uncomfortably steep for VFR climbouts.

Stall speed at gross weight is 42 knots with full flaps, with no eye-popping breakoff. I made a bunch of turns during slow flight and the airplane just doesn't have any bad habits. You don't want to input any more than 30 degrees of bank at pattern speeds, which is around 55 knots, although small power inputs slow the sink rate.

In cruise flight with a negative 6-degree flap setting, I saw 114 knots when throttled back to 5.4 GPH. At maximum continuous power, expect 120 knots, burning 7 GPH.

It's no secret that lightweight LSAs are a poor match for ham-fisted pilots and the Flight Design is no exception. A recipe for success starts by nailing the right speed—every time. The typical approach speed is 60 knots on base with 15 degrees of flaps deployed, slowing to around 55 knots on final approach. With flaps at 30 degrees, the speed decays to around 53 knots. I flew the airplane in light winds and with Tom Peghiny coaching from the right seat, I learned a thing about mass and gravity, and can see how pilots new to an LSA might crunch one during landing.

Going into the flare with limited engine thrust and a low mass means running out of energy pretty quickly. "You need to fly it down to the runway and then you need to fly down the runway a little and then land. Once you get used to that flare sequence, you can still put the airplane down in a short amount of space," Peghiny summarized. After a couple tries, I wasn't a pro, but competent.



The 2000-hour TBO Rotax 912iS Sport, top image, has 100 HP and miserly fuel burn. Dynon's dedicated 7-inch EMS/multi-function display, bottom, makes it easier than ever to manage.

WRAP IT UP

It's easy to see why Flight Design owners I've talked to gush over their airplanes and the 2018 CTLSi GT offers more than any previous CT model, particularly from a technology standpoint. It has a highly integrated EFIS/autopilot, a reliable and solid-performing liquid-cooled Rotax 912iS Sport, a whole-airplane parachute and a cabin with enough class to lessen the blow of a price tag that flirts with $180,000, fully optioned. For comparison, Bristell's NG5 and Tecnam's Astore LSA travelers typically sell for around the same price.

With a new parent company and an energetic distributor/support network that reports an uptick in sales, the future looks bright for Flight Design. I'm anxious to see what happens with the company's four-seat C4 project, an airplane that was knee deep in the revised Part 23 certification process before Flight Design's short hiatus.

For now, those being banished to or choosing the LSA world will find a lot to like in the CTSLi GT. As Peghiny put it, "It's like driving a Miata after selling your Corvette."

Levil BOM: Wind-Powered Backup

The BOM is a self-contained, self-powered external ADAHRS. Its real value may be more convenience than redundancy.

by Paul Bertorelli

To avoid being driven to the ragged edge of sanity by the profusion of ever-specialized avionics, we like to sort this stuff into bite-sized categories. the latest is one we would have never predicted: the wing-mounted, self-powered AHRS. As if one wasn't enough, there are actually two of these devices, the Levil Aviation BOM we're reviewing in this report and a new product called the WingBug, which we'll examine in a future report.

The BOM appeared as a prototype at Sun 'n Fun 2017 and in the year since, Levil Aviation has developed the production version, priced at $1995 complete. BOM is actually an acronym meaning Broadcasting Outer Module and Levil pitches it as a self-powered, always-ready backup device to provide complete attitude, airspeed and ADS-B data wirelessly to a tablet. The self-powering part is delivered by a small air-driven generator on the device's trailing end. It's reminiscent of the air-powered generators once popular in post-war taildraggers then delivered without electrical systems.

While Levil calls the BOM an AHRS, it's really closer to an ADAHRS because it has air data capability, including pressure sensing through a small pitot inlet and air temperature which, along with GPS, attitude, speed, altitude and ADS-B In, will feed into a handful of tablet apps that Levil's other products are also compatible with. That includes ForeFlight, WingX and FlyQ to name three. Levil has its own basic utility app that will display only essential flight data.

WING MOUNT

The fact that a gadget like the BOM can be installed without conniptions from the FAA and technicians shows how far we've come in just three years. The sole paperwork shipped with the BOM is the so-called NORSEE letter for Non-Required Safety Enhancing Equipment, the FAA's all-purpose, you're-on-your-own blessing to bolt stuff to the airplane that might enhance safety without compromising basic airworthiness.

Levil provides an online installation manual that recommends placing the BOM just ahead of the wing leading edge in undisturbed air and giving the GPS antenna a good view of the sky. This may prove challenging on some airplanes because there's no ready mounting point that far forward, such as a tiedown ring fitting or an inspection plate. Levil provides a small bracket for this purpose, but some minimal metal work might be necessary. On the Cub, I fabricated an angle bracket and attached the BOM to a jury strut.

The manual suggests giving the bracket and anchor a pull test to a resistance of at least 4.8 pounds. I stopped yanking on mine at 10 pounds, so no worries about it coming adrift. Levil says the BOM exerts about 1.5 pounds of drag at its maximum tested speed of 210 knots indicated. The Cub is too slow to suffer any noticeable speed loss, although a faster airplane might.

The BOM is intended to be powered by the air-driven generator, but it also has an internal battery so it can be switched on while stationary or off the airplane. It has a vibration sensor rather than a power switch, so shaking it like a salt shaker will activate it. It shuts off when the vibration ceases or it loses contact with the tablet. To charge the BOM ahead of using it, it has a charging port behind a removable access plate on the side of the de-

CHECKLIST

- ⊕ We'll concede the BOM is one of the cleverest gadgets we've seen.
- ⊕ Once the turbine is spinning, it fires up and functions reliably.
- ~ At $1995, it's on the expensive side as portable ADS-B goes.

vice. It's not convenient, but it works. Levil says 65 knots is sufficient speed to power the device and also charge the battery, but at a speed lower than that in the Cub, the battery appeared to be holding its own.

Aligning the BOM mechanically requires installing it as close to level relative to the wing as possible. But it's apparently not too picky about this. I used a level and a bevel gauge to find near level on the Cub and in flight, it required no further tweaking, although the utility allows you to do that. (Level flight in a J-3 is a vague experience, but the BOM provides accurate enough vertical speed data to actually nail it fairly accurately.)

IN FLIGHT

As claimed, the BOM comes alive as soon as the engine starts and shakes it up. It appears on the tablet as a wireless network and doesn't require a password. The apps I tried—Levil's utility and WingX Pro—had no trouble finding and displaying the data.

The Levil app can show actual airspeed—not GPS groundspeed—baro altitude and mag heading with an attitude indicator. There's also a vertical speed tape and, new with this version, an angle-of-attack indicator. The app has a diagnostics page that offers additional data, such as roll, heading, g-loading, battery state, lat/long and turn rate, to list a few. You can customize the data to use pressure, GPS or both and the heading source can be magnetic or GPS track. Levil warns that magnetic heading may be inaccurate due to ferrous interference. However, the BOM will learn the airplane's magnetic configuration, says Levil, and will slowly correct any detected errors. This data can be stored so it will be available for the next flight.

Flipping between the apps revealed a few seconds of latency, but I saw no data dropouts and the instrument readouts are fluid and well damped. The angle-of-attack display requires a brief calibration involving setting a "near stall" flight configuration and a max L/D configuration, which is essentially the best rate of climb speed. Since this isn't published for the J-3, best guessing is in order.

The AoA display has an analog representation that's essentially a lift-reserve indicator, with green, yellow and red segments. AoA sensing is done by comparative pressure through two tiny ports drilled in the nose of the BOM. And by the way, the pitot circuit is heated to provide some protection against icing, but there's not a lot of power available to keep it really warm, so how well it would perform in icing is unknown. Levil says the BOM has not been tested in icing conditions, nor is it intended to be used that way.

To get the most out of this device and whatever display you use it with, a semi-permanent mount of some kind for the tablet strikes me as a good idea. Placing the display in a panel mount or a robust yoke mount makes the instruments read almost like a six-pack. In my view, there's little question of the backup value of the flight data.

As we've come to expect, the ADS-B In—there's no Out function here—is sensitive enough to pick up high-altitude traffic from inside a metal hangar and it provides the usual FIS-B weather data. The standard caution applies on traffic. Without a complementary Out to draw in the local traffic package, you won't see all of the targets.

CONCLUSION

At $1995, what's this thing good for? Levil makes the case that it's a backup device if all else fails, but these days, even panel-mount avionics are equipped with internal batteries of all sorts. For $1195, Levil's own iLevil 3 SW can occupy the glareshield and provide battery-powered backup attitude data sufficient for navigation and an emergency letdown. The BOM ups the ante in sophistication by providing real air data and its own power source, if that appeals.

More attractive, in my view, is the convenience. Without fooling with a glareshield-mounted device with the external power cord, the BOM is simply out there. After takeoff, just start the tablet, pick your app and you're in business. That has value. Unknown is how the thing will behave and survive long term in rain and ice and how durable that little generator will be. Levil says the generator—the aft-most module—is easily replaceable.

The BOM appears well-made, with three individual cylindrical modules fastened by screws and protected against moisture incursion by Buna O-rings. In addition to being heated, the pitot circuit is fitted with drains to keep moisture from accumulating. Before buying, I would recommend noodling the installation a little. The ideal simplest install is to attach it to a bracket on an inspection plate, even if that's aft of the leading edge. It appears to me that the GPS is more than sensitive enough to receive position data from under a wing. Aerodynamically, that's not ideal, but for a backup, who cares?

Levil's AHRS utility, top, displays PFD data, plus detailed information from the ADS-B datastream. It works with other apps. A weather-proof removable cover, lower photo, provides access to the charging port.

YouTube See a video review of the BOM at http://tinyurl.com/j95ht2a

Hard-Landing Damage: Firewall, Gear Repairs

Hard landings happen, but major damage to the airframe can go unnoticed. Look closely for firewall, landing gear and wheel damage when shopping used airplanes.

by Kim Santerre

Sooner or later your used aircraft search will find an airplane that's suffered a so-called hard landing. While that's the sugarcoated word for damage history, in some circumstances this is hardly a deal breaker. Other times, it's best to walk away, especially if the damage has gone unnoticed or left unrepaired.

What's the definition of a hard landing, exactly? Few service manuals are specific other than describing it as the airplane touching down with an excessive sink rate. But what matters is the type of damage sustained, how it's repaired and its effect on resale value.

That's what I'll cover in this article, paying close attention to high-dollar repairs like bent firewalls, landing gear mounts and other major airframe components. I'll cover damage to tailwheel airplanes in a separate article.

PANCAKES AND WHEELBARROWS

I won't analyze the reasons for landing hard, but most firm arrivals take two common forms—the pancake, where the plane smacks hard on all three wheels from slowing to a stall too high above the runway, and the more dramatic wheelbarrow, where the aircraft is in a nose-down attitude and the nosewheel strikes first. Since the nosewheel is the least robust gear component on most tricycle gear aircraft and wheelbarrow landings are common, I looked at them carefully from a damage standpoint.

I recently followed a forum thread on this topic and found it interesting that some relatively experienced pilots exclaim in disbelief that they bent the firewall on their "slightly botched" landing (the airplane was a 1966 fixed-gear Cessna 182). While this is generally a pricey mistake, not all aircraft are created equal in firewall damage susceptibility.

In contrast, the robust gear on the original Beechcraft Bonanza was drop-tested at a simulated 1200 FPM to meet aircraft carrier landing specifications (controlled crashes, Navy pilots chide) for the Navy. At the time, Beech was hoping for a Navy military trainer contract (T-34). The Bonanza is also certified in the utility category. But that's not to say that the Bonanza hasn't had its share of issues; there just aren't the number of landing gear crunches or bent firewalls seen with others. After logging over 2000 hours in various Bonanzas—old and new—plus in the T-34, I can attest to the robustness of the gear. That said, all certified aircraft must meet a minimum FAA design standard, but there is a certain variation in how the nosegear strut is mounted to the aircraft. Let's look at that closely.

NOSEGEAR MOUNTING

Nosegear mounting takes three common forms on typical GA aircraft. The first is common on the most popular fixed-gear Cessnas, where the nose strut is attached to a primary structure—the stainless steel, thin, reinforced firewall. This is seen on the fixed-gear models of the 172 Skyhawk, the 177 Cardinal and the 182 Skylane. The Cessna 150/152 series utilize a different method in which the strut is attached to the tubular steel engine mount. Thankfully, it's quite rugged and designed well for the training environment.

On Piper Cherokees, the nose strut is attached to the tubular steel engine mount. That means the engine mount would absorb the initial damage in a hard landing, but it could also damage the firewall and engine mount if the impact were hard enough. Don't underestimate the cost of replacing a bent engine mount, as welding is a specialized task and can be major work.

Worth mentioning is that the Bonanza is different than most all others, including its Skipper, Sport and Sundowner siblings. That's because only the Bonanza and its variants (the Debonair, for example) employ an aluminum tub attached to the firewall with a raised aluminum section, allowing room underneath for the retracted nosegear. The tub runs the length of the engine and the engine mounts to the tub much the same as on other aircraft, where the engine mounts to a tubular steel engine mount. The nosegear is totally separate under this aluminum tub. It is a robust structure, but can certainly be the cause of grief during some engine maintenance—take it from someone who maintains his own Bonanza.

IS IT BROKEN?

Hit hard? Don't fret, because not every firm arrival means the aircraft sustained damage. But if you hit the runway hard enough to wonder if you bent or broke something, then you probably need to have a qualified tech look it over before you fly it again.

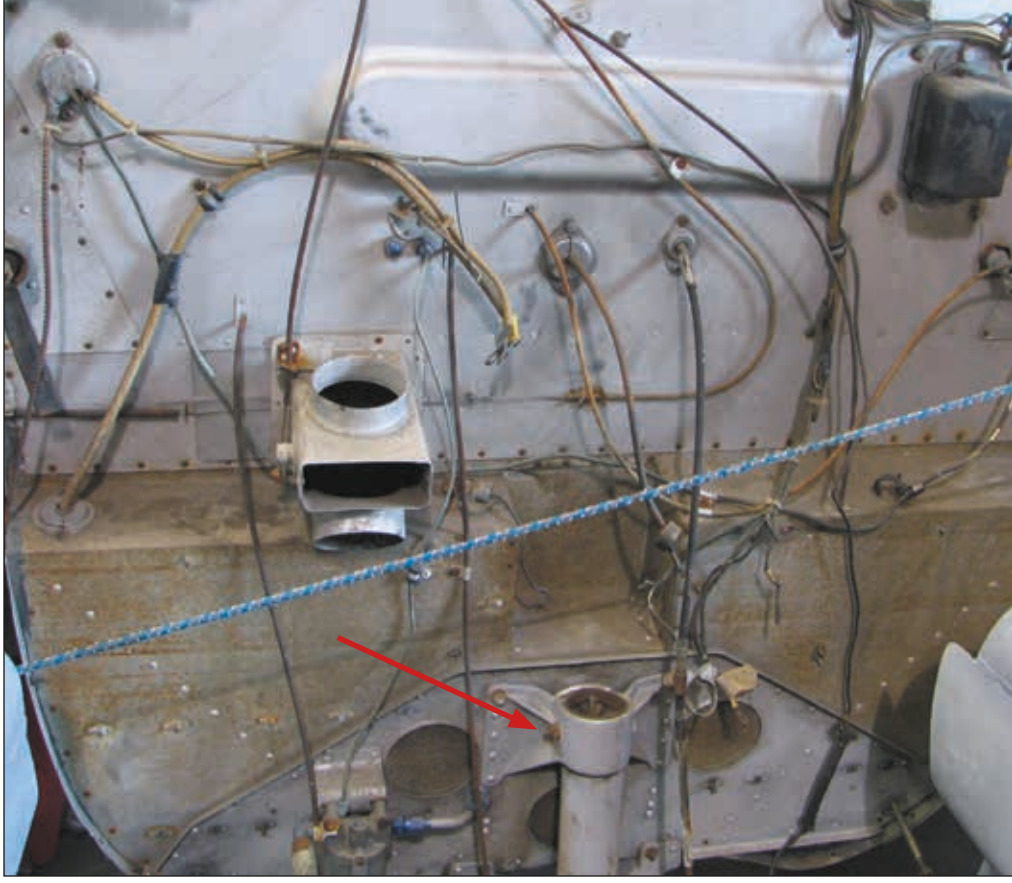
Still, there are things you can do to lessen the blow of landings gone wrong and it starts with good maintenance. In particular, this means proper upkeep and preventive maintenance of the landing gear components. Touch down hard enough and you'll want to start with a thorough inspection, which could mean putting the aircraft on jacks. For retracs, it also might include a landing gear swing. But before going to the shop, eyeball it yourself.

Start at the nose with a visual inspection and preferably remove the cowling to look for any signs of damage to the firewall. It might be tough to spot, but any wrinkling is a cause to call in a mechanic. It is essential to not fool yourself, but rather err on the side of caution if there's any doubt. The aircraft service manual (which I recommend you have on hand) is a good place to start.

Many service manuals I have reviewed have a section dedicated to evaluating hard landing damage. It starts with checking for signs of damage to the paint, although a visual inspection of the painted surfaces alone does not guarantee that there isn't damage. Of course, an owner would be well served to have a good idea of what the airplane looks like in an undamaged state to make comparisons easier. That's not always the case when shopping for a used airplane.

If at first you spot no skin wrinkles, the next step is to stand away from the aircraft and see if the wings are still level and it sits in what looks to be a level attitude. Be sure to do this on level ground, of course. Do some ground running, too, but taxiing isn't a sure way to spot damage

According to feedback from several shops during my research and from my own experience, the aircraft may be damaged beyond economical repair in a hard landing and have no outward appearance or symptoms of major damage. For that reason, I never suggest underinsuring. When it comes to hull damage consider that the insurance company may total the aircraft in the event of an accident costing more than the hull insurance. A bent firewall or engine mount typically constitutes a major repair. Moreover, firewall damage hardly ever occurs as isolated damage. Associated structures may be damaged as well, as might other systems that you may not initially consider. These include bracketed control pulleys attached to the firewall structure, which could have a change in tension as if the firewall bends. But there's more than the firewall to consider.

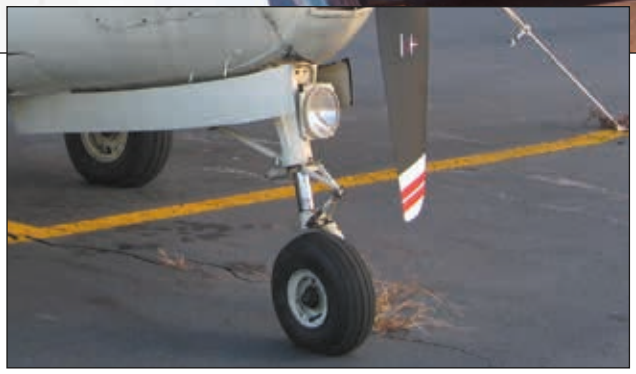


The red arrow in the top image points to the nose strut attachment point on a Cessna firewall. Look closely at the condition of the tires during every preflight inspection. Visible cords and cuts could be signs of a landing blowout ready to happen.

Hit hard enough and tires, wheels and struts may be damaged, sometimes not even identified during the annual inspection. The most proactive owner may keep abreast of aircraft service bulletins and ADs, but after 46 years owning and maintaining aircraft I've learned that an annual inspection (especially a flat-rate annual) isn't always a guarantee of ironclad airworthiness.

KNOW THY DESIGN

It's easy to use the fixed-gear Cessna 172/182 in examples of hard landing damage, but my intent is not to single it out. The large numbers of these aircraft produced combined with greater than a half century in service tends to disproportionately show bent firewall accidents perhaps more than less popular models, or at least ones with



The Bonanza in the top photo had a nose strut failure on landing. Notice how far forward the nose strut is mounted (inset), which virtually eliminates the chance of firewall damage should you wheelbarrow. Corrosion isn't a favorable match for landing gear components, bottom photo. Some bargain finds just aren't worth it unless you're prepared for major rebuilding.

shorter time in service. But it's worth contrasting this gear design with that of the fixed-gear 177 Cardinal, with a nose gear that also mounts to the firewall. In my research, shops experienced with Cessna repairs stressed to pay close attention to the forward cabin side skins on a fixed-gear Cardinal during a prepurchase inspection. That's because there's limited structure behind the firewall for direct support.

Worth considering in the training environment is that the 177 Cardinal's elevator design differs from other 100-series Cessnas and is partly responsible for running out of elevator effectiveness in some landing configurations. I have some time in all models of 177s and found that the early models can be a bit more demanding in landing without the right training.

What I'm getting at is some aircraft have a reputation for being prone to firewall damage, but some of that is affected by loading configurations such as only the pilot and front seat passenger being onboard, tending to make some aircraft more nose heavy. As a result, a firewall-mounted nose strut may be more prone to causing firewall damage in the event of a nose-first landing. But it isn't a reason to avoid a given model. In my view the problem is more one of proper training and pilot awareness of the specific model and cabin load configuration, as well as fuel quantity and its effect on CG.

Modifications can help, as Cessna figured out early on. Issued in 1971 and affecting older Cessna 182 models from 1962 to early 1970, Cessna SE71-5 pertains to a service kit that beefs up the firewall strut mounting assembly. The kit was incorporated into factory models from later 1970 and on (gross weight increase to 2950 pounds). This kit not only includes special brackets, but also requires a special high-temperature sealant to ensure certified fire and gas leak standards, as well as use of solid shank rivets to ensure factory certification standards are maintained. Installation of this kit uses 11 pages of instructions. It was estimated to take 75 man hours to install the kit including engine removal. While the entire kit is no longer available, the metal parts are available separately.

TIRES, WHEELS AND STRUTS

A hard landing may not result in aircraft damage at all if its wheels, tires and struts are maintained to high standards. Walk down any ramp and you can spot airplanes with nosewheel struts sitting barely an inch from bottoming out. You'll also see the opposite—overinflated struts. These aircraft are much more vulnerable to hard-landing damage.

If a strut is too low it will translate into early metal-to-metal contact with adverse consequences to the airframe. If the strut has the improper air-to-fluid ratio, the strut will perform poorly. In fact, just taxiing with a deflated strut may cause damage constituting a major repair.

Strut maintenance is normally not a pilot DIY item since most struts require access to high-pressure air at the airplane, and a portable air tank is typically insufficient.

Tire blowouts are quite rare under most circumstances, including hard landings. That's of course provided the tire is in airworthy condition, meaning no cord is visible through sidewalls, for example. Weak sidewalls also contribute to a reduction of landing cushioning, as does under- or over-inflation. Another problem is a tire being the wrong ply rating (too low or too high ply rating), which contributes to too little or too much

cushioning on landing, as well as during taxiing. The aircraft type certificate data sheet, available on the FAA website, has valuable information on the approved components, speeds and weights under which your aircraft is certified, including the tire ply rating.

Locking a brake on the mains can destroy a tire in a few seconds or cause loss of aircraft control. In a poorly maintained airplane it may also cause the nosewheel to collapse. Locking a brake can be from improper maintenance or overzealous brake application. Small planes do not have anti-lock brakes, although newer brake technology makes it more difficult to lock up the brakes. Berringer, for example, offers a line of modern brakes, wheels and tubeless tires that might be worth the investment.

Wheel failure is a possibility in a hard landing, especially for wheels that are poorly maintained. Generally, wheels do not tend to bend but rather break. Hasty annuals can skip items that generally look all right on the surface, such as wheels and tires, but they could be ready for failure. Check for missing paint, corrosion and hairline cracks on wheels. Unless you change your own tires you will not know the condition of the through-bolts that hold the wheel halves together. The visible condition of the outer wheel is a good indicator (but not a guarantee) of the inside condition. Repairs to wheels, including welding, constitute a major repair.

CHOOSE YOUR BATTLES

It goes without saying that employing a mechanic with extensive repair experience on the aircraft model you're considering is imperative. Their fees to handle the prepurchase evaluation will be a bargain compared to getting stuck with an airplane that has a damaged firewall or repairs done incorrectly. The same goes for bargain finds that have been sitting for long periods of time, where corrosion takes its toll and can lurk on wheels and other critical components.

If you must go it alone, for starters be sure to go over the aircraft carefully (including the firewall) looking for skin wrinkles, the use of pull-through rivets on the firewall's structure, uneven rivet repairs, dents or unchecked corrosion anywhere. It should be easy to spot a shoddy repair, but difficult if not impossible to spot a good repair.

Properly serviced landing gear struts should be the first defense against landing damage. The strut on the airplane pictured at the top is a bit overinflated. If you plan to operate on unimproved strips, consider a taildragger. You'll have to try hard to buckle its firewall, bottom.

A title search, researching FAA 337 forms, a relevant AD search, checking both the FAA incident reports and NTSB accident reports can tell a lot about the history of an aircraft, as can maintenance logbook entries, of course. The likelihood of finding a 40-year-old airplane with no damage history is slim, but with any repairs, particularly major ones, be sure they were properly logged. As I said earlier, quality repairs to landing-induced damage should not eliminate the plane from consideration, but it is a point to begin negotiation if you know the market. Type clubs are a huge resource.

If you do strike a deal on an aircraft that has damage needing repair, you might find yourself hiring a ferry service to move it (after securing a maintenance ferry permit) since it might not be airworthy. Some shops specialize in transporting, ferrying and repairing. For example, Beegles Aircraft Services (www.beeglesaircraft.com) offers a complete turnkey service (including disassembly and transport) and specializes in major structural repairs. Tennessee Aircraft Services (www.tennesseeaircraft.net) is another I can recommend. There are others.

Last, if you want to avoid having to deal with landing damage, choose your battles and the right airplane for the job. During one Alaska trip where our gaggle of five airplanes landed at many remote and unimproved runways, our flight leader bravely landed first to advise the rest of us on any unusual conditions. He had over 2000 hours in his beloved Mooney and still ended up doing a whoop-de-do on an undulating dirt strip. We watched from above as his airplane hit tail first and then on the nosewheel, damaging the fuselage and wrinkling the aft fuselage, which signaled internal damage. When you push the envelope, sometimes the conditions bite back. Luck favors the prepared.

Contributor Kim Santerre was Editor of retired sister publication Light Aircraft Maintenance and is a 20-year Beech V35B Bonanza owner based in Virginia.

Bad Elf Wombat: Portable Data Burner

The Wombat is a pocket-sized Wi-Fi hub for transferring Jeppesen databases from a smartphone or tablet. It's stone simple to use and has impressive battery life.

by Larry Anglisano

Wouldn't it be so much easier to fetch Jeppesen databases on the fly with a tablet or smartphone? Instead, you log into your Jeppesen account on a desktop or laptop computer (what was the #%$! password?), transfer the data to the datacard and then bring the card back to the airplane. While this sounds like it should be easier than it is, some pilots dread the monthly data update chore like a trip to the dentist.

Bad Elf—the folks that developed a series of GPS receivers and data loggers to use with iPads—has a solution with the Wombat. We think it's easy to use, it's built well and it's worth the $250. Here's a look.

LIKE A WOMBAT, SORT OF

Native to Southeastern Australia, Wombats have back-facing pouches for carrying their young, so Bad Elf figured that Wombat would be a fitting name for its latest product since it has a pouch (well, a slot and a USB port) for carrying nav data storage cards and thumb drives.

Bad Elf teamed with Jeppesen, which has launched a mobile version of the Jeppesen Distribution Manager (known as the JDM database utility) that for years ran primarily on desktop and laptop computers. The idea behind the Wombat is to completely eliminate Jeppesen's JDM on a desktop or laptop.

With so many pilots carrying smartphones and tablets to and from the cockpit, it only makes sense to be able to handle every stage of a navigation database update—wirelessly—from the cockpit. Until the Wombat, that was easier said than done.

That's because the majority of tablets and smartphones don't have USB ports and SD card slots, which is how navigation data is stored and loaded into panel avionics. That's not changing.

But the Wombat accommodates all storage formats, including the SD cards used in Garmin's G1000/3000/5000 flight decks and the GTN series retrofit navigators. Since the Wombat also has a standard USB port, Jeppesen's Skybound Reader adapter (used with legacy Garmin navigators for Garmin Navdata updates) can be used. The Wombat is also compatible with Avidyne data updates, since these avionics access nav data from a USB thumb drive.

With the Wombat, left, you won't have to leave the cockpit for database updates. Pop the nav datacard or thumb drive in, burn the data and then put the card/drive back in the avionics.

FEATURES, CONTROLS

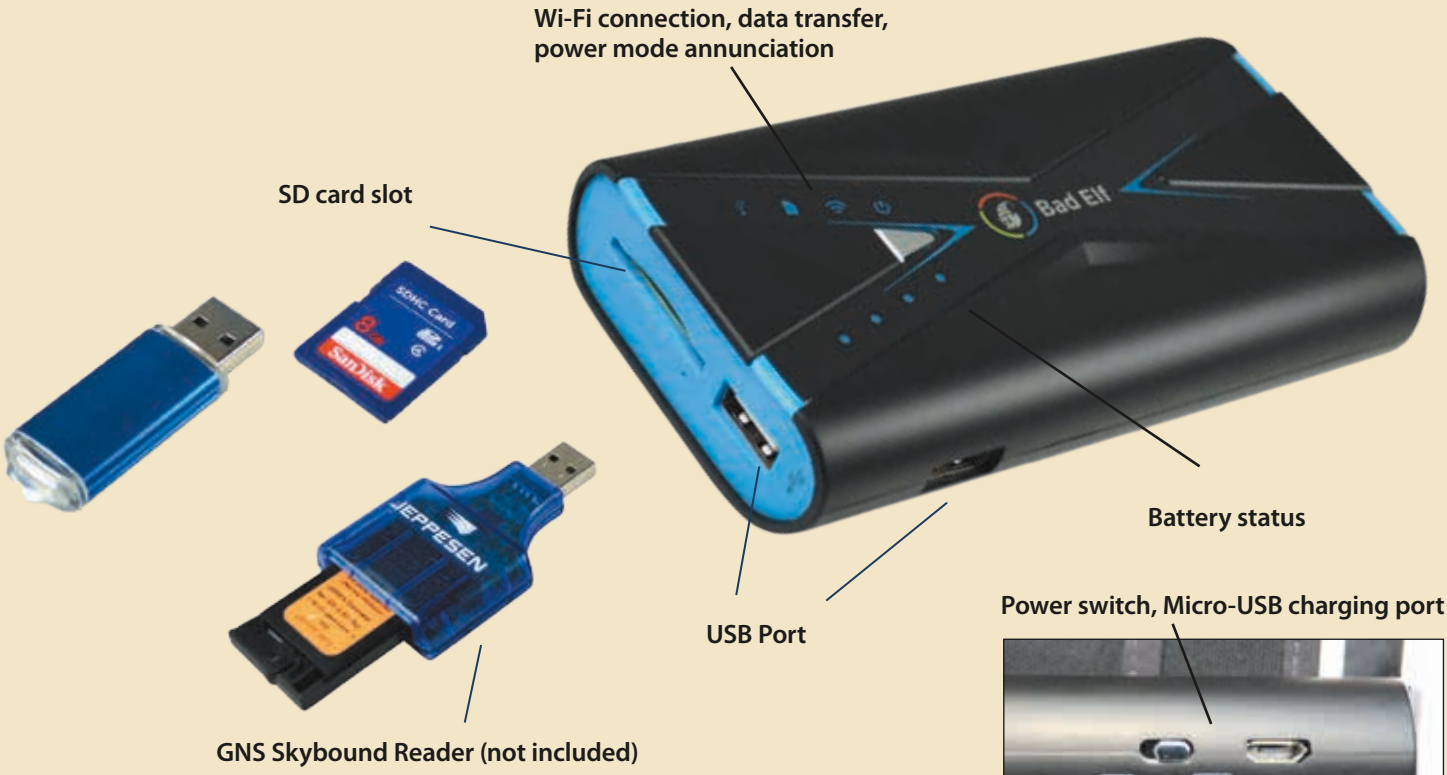
Given the bandwidth that's required for large database files, building the Wombat device around a Wi-Fi platform was a no-brainer. It has no Bluetooth connectivity. Moreover, Bad Elf sees more growth potential with a Wi-Fi interface, since it's built into Avidyne's navigators and also in Garmin's Flight Stream wireless data hub.

The Wombat has minimal user controls. There's a power switch on the side of the case and its internal battery is charged via Micro-USB. Bad Elf says the battery life is plentiful—like months' worth of power when only doing database updates—because it has a built-in 9000-mA battery. Tap the silver triangle on the front face and four LEDs show the battery status. The device can be charged from any USB source, preferably a high-current (2 amps or greater) source.

Speaking of power sources, the Wombat can be used as a USB battery bank. The device's side USB port supplies a 2.4-amp output for charging an iPad or fast charging a smartphone. The other USB port on the front won't charge an iPad, but does output 1.0 amps of current for charging other devices.

When powered up, the Wombat's Wi-Fi annunciator shows that it's connected. Connecting your phone or tablet to the Wombat won't provide internet access. This is for data transfer only, and a data transfer annuncia-

WOMBAT AT A GLANCE



tor lets you know data is flowing.

Since the device transfers data at typical Wi-Fi speeds, standard 28-day data updates can be sent from the tablet/smartphone into the Wombat in as little as 15 seconds. Chart updates will take longer, perhaps eight minutes, and large files like terrain databases can take as long as 25 minutes. Remember, you're still writing data to flash memory, so data speed depends on the storage card you're writing to.

Connecting the Wombat to your smartphone or tablet is the same as connecting to any Wi-Fi network. Look for and select the device, enter the Wi-Fi password and join.

As for loading the databases, if you have a JDM account through Jeppesen, simply use the free Jeppesen JDM app to download and install data updates similar to the way you did it on your desktop computer. JDM works with Avidyne IFD, FlightMax and Entegra systems, and with most all Garmin systems including legacy navigators like the GPS150/155. If you download your databases from OEM websites like Honeywell, for example, you use the free Wombat app to capture the data.

Bad Elf offers a $499 turbine version of the device for working with business aviation avionics from Honeywell (Primus Epic), Rockwell Collins Pro Line 21 and soon the Garmin G5000, which is found in a growing number of jet applications. Jeppesen still provides the data for these avionics. Worth mentioning is that the turbine version was developed for large jet fleet operators, who quickly embraced the device simply because of the effort that's involved in updating avionics in the middle of a trip. The ability for crews to grab the nav data with their iPads while seated in the cockpit (instead of downloading to a laptop in a hotel room or inside the FBO, where Wi-Fi speeds may be slow) is an easy sell.

Bad Elf said there will soon be compatibility with Aspen, Dynon, Advanced Flight Systems and Grand Rapids Technologies avionics products through the JDM Mobile app.

MORE THAN DATABASES

Since some avionics record flight logs and engine data, you can use the Wombat to harvest the data and share it with third-party apps, including Savvy Analysis (engine data), the CloudAhoy debriefing app and the web-based Cirrus Reports, for flight log and engine analyzer data.

It just makes sense to do data updates with a tablet or smartphone, which is possible with Garmin's Flight Stream wireless hub and database concierge through the Garmin Pilot app. But that requires installing the Flight Stream 510 hardware, which doesn't work for transferring nav data into legacy avionics like the GNS530/430. But the Wombat will, using the Skybound Reader.

We're shocked it took so long for this practical solution for database updates. "Pilots told us they moved almost every aspect of their flying life to their iPad, but still have to deal with their desktop and laptop computers every 28 days for nav data updates," said Bad Elf's Bret Hackleman. If you currently pay a shop or FBO to do your updates, the Wombat could pay for itself in short order.

For more, contact Bad Elf at www.bad-elf.com and at 855-422-3353 in Tarriffville, Connecticut.

Bellanca Viking

It's fast, has pleasant handling and timeless good looks. But don't even think about purchasing one without a thorough inspection from a Viking expert.

These days it's hard to imagine that a wood and fabric four-place piston single like the Bellanca Viking still exists, but it does. And although there aren't great squadrons of them around, the Viking retains a loyal, almost cultish following.

That's because there's really nothing quite like the Viking. There's a lot to like. The aircraft handles well with few gotchas and it's so strongly built that owners still delight in showing the famous factory picture of a dozen cheerleaders standing on the wings. "Try that with an aluminum airplane," goes the advertising tag line.

> ***The Viking is almost universally praised for its light, smooth aileron control.***

MODEL HISTORY

The Viking's family tree traces its roots back to the Bellanca Cruisaire, a triple-tailed retractable taildragger design reminiscent of aviation pioneer Giuseppe Bellanca's early designs. The first Model 17 Viking appeared in 1967, powered by a 300-HP Continental IO-520-D. The model evolved gradually, but other than the engine, there were few major changes. The Continental-powered Viking was called the 17-30, while the 17-31, introduced in 1969, was powered by a 290-HP (later 300-HP) Lycoming IO-540, either normally aspirated or turbocharged. Either engine was available for much of the early production run; the 17-31 was discontinued after 1979 and in 1996, the Continental IO-550 was made available as an option. Some earlier airplanes have been retrofitted. The original hydraulic gear and flap actuation system was redesigned midway through the 1968 model year with the introduction of electric flaps.

The original fuel system—five tanks, two fuel selectors, eight possible combinations of selector settings and several sometimes incomprehensible gauges—was simplified to a left, right and aux system in 1974. After that mod, the fuel mismanagement accident rate for Vikings dropped dramatically. Production continued at a modest rate—in the peak production year, 1973, just under 200 were built—significant volume by modern standards, but a trickle for that era.

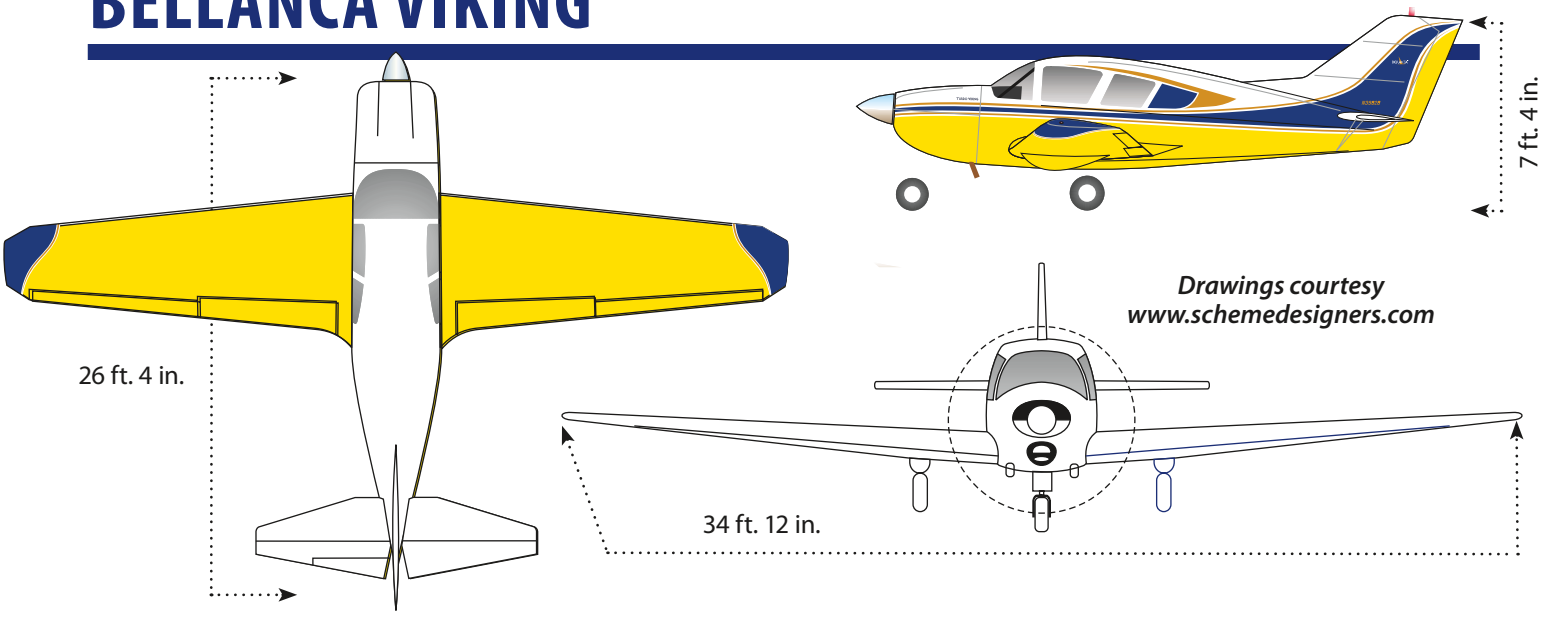
Bellanca Aircraft Corp. went bankrupt in 1980, the year things turned sour for the entire industry. In 1984, the company got back on its feet and started building Vikings again on a limited, custom-order basis. Only nine were built in 1984 and 1985 and none in 1986. About 38 were produced between 1984 and 2005.

In 2001, Bellanca went bankrupt again. In 2002, a group of six Bellanca enthusiasts bought the company from the state of Minnesota and established Alexandria Aircraft Co. LLC. Their immediate goals were to provide technical support and parts to owners and A&Ps in the field.

By early 2010, however, market conditions no longer supported this enterprise and the assets of the factory were put up for auction.

There are about 1360 or so Vikings in the fleet, most of which are Continental-powered. The owners of AALLC also reduced parts prices substantially and rewrote the type certificate for Continental-powered Vikings, which helped prospective buyers looking to replace a run-out

BELLANCA VIKING

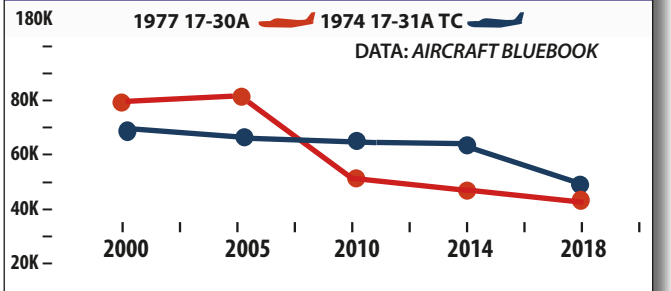


Drawings courtesy www.schemedesigners.com

SELECT MODEL HISTORY

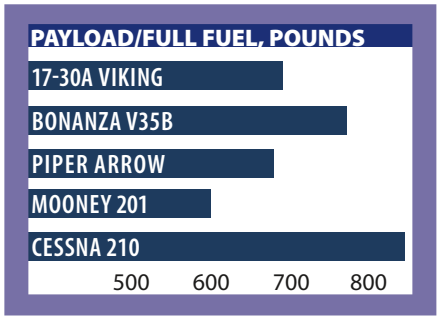
MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1967-1970 VIKING 17-30	CONT 300-HP IO-520-D	1700	$30,000	60	1078 LBS	170 KTS	±$30,000
1969 VIKING 17-31TC	LYC 250-HP IO-540-GIE5	1600	$40,000	72	1190 LBS	190 KTS	±$38,000
1969 VIKING 17-31	LYC 290-HP IO-540-GIE5	1600	$40,000	72/92	1108 LBS	190 KTS	±$29,000
1970-1974 VIKING 17-30A	CONT 300-HP IO-520-D (K)	1700	$30,000	92	1108 LBS	170 KTS	±$37,000
1970-1974 VIKING 17-31ATC	LYC 290-HP IO-540-GIE5	1700	$40,000	72	1190 LBS	190 KTS	±$47,200
1975-1980 VIKING 17-30-300A	CONT 300-HP IO-520-K	1700	$30,000	92	1140 LBS	170 KTS	±$66,200
1975-1978 VIKING 17-31A-300	LYC 300-HP IO-540-K1E5	2000	$40,000	92	1140 LBS	190 KTS	±$52,000
1980-1990 VIKING 17-30A	CONT 300-HP IO-520-K	1700	$30,000	92	1108 LBS	170 KTS	±$87,500
1991-1997 VIKING 17-30A	CONT 300-HP IO-520-K	1700	$30,000	92	1108 LBS	170 KTS	±$135,300
1998-2001 VIKING 17-30A	CONT 300-HP IO-520-K	1700	$30,000	92	1108 LBS	170 KTS	±$201,200

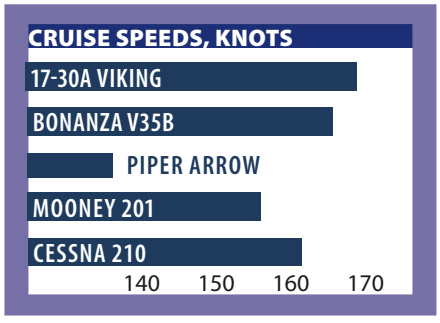
RESALE VALUES

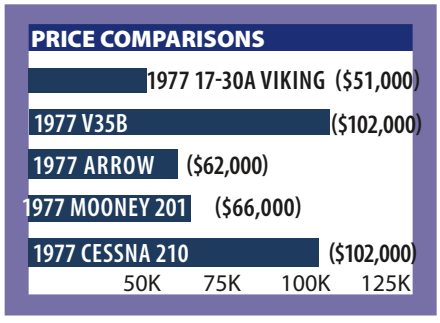


SELECT RECENT ADs

AD 08-05-11	MUFFLER AND TAILPIPE CRACKS
AD 96-18-07	NOSEGEAR BRACKETS
AD 98-02-17	LANDING GEAR FITTING ASSEMBLIES
AD 86-25-06	MAIN AND AUX TANK INSPECTION
AD 76-08-04	WOOD DETERIORATION CHECKS







That's the instrument panel in Mark Sellers' 1985 Viking, top photo, and Scott Kennedy's 1978 panel below. (Yes, that's a venerable KX170B backing up a Garmin GTN navigator.) Airplanes after 1973 had the tall panel, a standard radio stack and T-configured instruments.

Continental IO-520 engine with a IO-550.

PRICES DOWN

And there are enough Vikings on the market to offer buyers a good choice at remarkably good prices. According to the *Aircraft Bluebook*, early Continental-powered 17-30s hover around $30,000 while mid-1970s Vikings are in the high $40s. The latest models, which the *Bluebook* shows as 2001, are listed at $205,000. We found several for sale online. All things considered, these prices represent a good value, but Viking experts told us that prices have dropped recently.

Look for one that has flown regularly and, above all, has been hangared or at least sheltered. Moisture in the wings is the biggest threat to the value and the airworthiness of the airplane and drying them out at 160 knots is the best thing for them, owners say.

BUILD, PERFORMANCE

The Viking is nothing if not sturdy. Inside the wing are two laminated wood spars running the length of the wing, connected by a system of ribs. Inside the fuselage is a latticework of stout steel tubes that form the engine mount, then carry through the fuselage to form the tail. Add laminated spruce forming one axis and a steel roll cage forming the other and you've got a very sturdy airframe with better occupant protection than many modern designs can claim. By modern standards, the Viking is a credible but not exceptional performer. Normally aspirated models cruise at around 160 knots, 10 knots slower than heavy singles like the Cessna 210 and A36 Bonanza. The turbo helps, of course. Haul the airplane up to FL200 and you'll see 190 knots. On the other hand, a Viking will outclimb a 210 or an A36.

The book claims 1210 FPM and owners report similar numbers. For all its power, the Viking's useful load is typically 1000 pounds or so and even less with a lot of equipment on board. That's in the range of an average 200-HP retractable, such as a Mooney or Arrow. On top of this, the big engine requires a lot of fuel, which further limits the cabin load.

Fuel capacity is either 60 or 75 gallons, but owners say there don't appear to be many 60-gallon versions. In fact, aux tanks in early models bring the total to 92 gallons. "With full fuel, my 1973 Viking will carry three passengers, or two passengers and baggage," one owner told us. This payload is typical of all aircraft of this era. Commented another about his turbo: "Lycoming engine, heavier than the Continental, plus two turbos, equals a pathetic full-fuel legal load of two adults plus bags." Compare that to a Cessna 210, which has a useful load pushing 1400 pounds in some cases and can typically haul 92 gallons and four people plus baggage.

But the Viking has always been more sports car than pickup truck. With all four seats occupied by FAA-standard humans and 100 pounds of baggage, the airplane can ship maybe 40 gallons of avgas—enough to fly 250 miles with IFR reserves. However, most owners of post-1973 Vikings comment that they're content with a choice of full seats or full tanks and insist that their bladders usually give out before the fuel does.

HANDLING

"The way the Viking handles will put a smile on your face; very smooth and responsive controls," said Lange White about his 1967 Viking. White isn't alone with his sentiments.

The Viking is almost universally praised for its light, smooth aileron control. "The Viking is a very stable aircraft in turbulence and IMC conditions with no Dutch roll due to the very ample vertical stabilizer. It rolls and handles like a sports car—not like a station wagon," reports owner David Alger. "My Viking has the same empty weight as the Lance I used to fly, about 2225 pounds. But

the control feel and harmony are just wonderful. Low-speed control on the Viking is excellent and makes short field operations easy, and the stall is very mild. It's also a very good IFR platform, not twitchy and pleasantly light on the controls," says Mark Sellers.

Landing can be tricky, however. Power off, with gear and flaps out, the Viking has an awesome sink rate that owners liken to Steinway pianos. The steep descent angle, however, does allow a skilled Viking pilot to make short landings and the excellent climb rate enables the airplane to depart from short fields just as well.

The Viking's cabin dimensions are modest at best, a reflection of its 1930s design heritage. "The cabin is small for two guys my size," reports a 210-pound Viking pilot. Even a rabid pro-Viking zealot admitted that the cabin is "not roomy." Not as tight as a Mooney, maybe, but no 210, either.

Interior appointments draw raves. Many Vikings have a leather or crushed-velour upholstery that puts the chintzy interiors of Pipers and Cessnas to shame. Cabin noise, on the other hand, is high, although some owners tell us it's no worse than other aircraft. "A Viking is certainly no louder than any other single-engine GA aircraft of similar vintage. Anyone flying any single-engine GA airplane without ANR won't be able to hear much after a while anyway," says Craig Gifford.

We don't think there's much to differentiate the two normally aspirated engines from an ownership point of view. The turbo is another matter. Prospective buyers should carefully consider whether the extra acquisition cost, complexity, fuel consumption and potential overheating problems are worth the benefits of turbocharging. Since it's a turbonormalized system—you get full power all the way to the flight levels rather than an extra boost on the ground—in most cases (outside the Rockies, at least) the answer is probably not. One reader who owned both advised against the turbo version.

The gear system is robust, but there's apparently some confusion in the field about exactly how to adjust the limit microswitches to make the system work well. The emergency gear extension in a Viking is two-thirds foolproof and one-third tricky. When the mains retract, they fold forward and are held there under pressure, so dumping pressure causes them to fall into the slipstream and lock.

Step one of the emergency extension procedure is to slow the airplane to 90 knots, so the over-center spring can push the nosegear through the slipstream and let it lock. No cranking or huffing and puffing necessary—just slow the airplane down.

The cabin isn't cavernous, but it's surrounded by good crash protection.

HANGAR IT

Owners were all but unanimous in emphasizing the need to hangar a Viking. "Absolutely imperative!" said one. "A crucial necessity," echoed another, although one reader insisted a shade hangar in a dry climate is good enough.

"I keep my Viking inside. But I would keep any airplane I fly IFR inside. Wood deterioration is a function of moisture content. Keep your wood dry and rot can't happen. Simple as that. That said, I often fly in rain and leave the plane outside on trips," reports Mark Sellers.

The primary reason is to prevent the accumulation of moisture that can trigger wood rot in the wing, but it's also a good idea to protect the fuselage fabric from ultraviolet radiation and moisture.

The "lifetime" Dacron covering will last a long time in a hangar, but owners report the need to recover in as little as six years if the airplane is left outside.

Factory support for the model is, well, iffy. Still, owners and techs say parts are generally available from Alexandria Aircraft LLC and the website is still up at www.bellanca-aircraft.com. Furthermore, the airplane's rag, tube and wood construction means that not every mechanic will be familiar with high-level repairs, but support isn't really an issue if you know where to go. There are a few standout shops that know these airplanes

"I personally don't worry about AALLC because it's really the shops at Rocket, Weber, Witmer and MARS (nicely covering all parts of the U.S.) that keep these airplanes flying. The future of 100LL poses a far greater risk to the Viking future than the status of the factory," says Craig Gifford.

RESOURCES, TYPE CLUBS

We're told by Viking owners and techs some of the best resources for prospective buyers include the Bellanca-Champion Club, led by President Robert Szego. Find it at www.bellanca-championclub.com.

There's also the Viking Pilot's Forum at www.vikingpilots.com/forum.php. There is also a good FaceBook presence at www.facebook.com/groups/694640897235405.

EXPERT TECH ADVICE

When it comes to maintenance, the Viking is comparable to other complex airplanes in terms of cost as long as it's properly maintained. A lot of the difficulties with the wood wings are related to inadequate or incorrect maintenance practices. This is because many techs simply aren't trained how to inspect and repair wood and fabric structures.

You'll find a variety of Vikings during the hunt. Here's a quick reference. There are three basic models of the Viking: the Continental-powered 17-30 and 17-30A, the normally aspirated Lycoming-powered 17-31 and 17-31A and the turbonormal-

VIKING ACCIDENTS: FUEL RELATED

One of the challenges facing airplane designers is where to put enough fuel to give the machine decent range. Complex wing structures on early airplanes made the process particularly difficult.

Our review of the 100 most recent Bellanca Viking series accidents brought to the fore the fact that the line descended from a design that simply didn't have space in the wings for large fuel cells. The solution to the problem of carrying enough fuel for the larger engines of the newer models was to install more tanks—wherever space could be found. We know of at least one model Viking that sported seven fuel tanks.

Any time an airplane has more than one fuel tank it leads to the perennial human factors problem with such designs: With distressing regularity, pilots cannot manage to coordinate positioning the fuel valve(s) so as to maintain a supply of fuel to the engine. Of the 31 fuel-related accidents we examined, the majority involved fuel exhaustion in the tank selected while at least one other tank had more than enough fuel in it to take the airplane to its intended destination.

We think fuel management is a buyer beware matter for anyone considering a Bellanca Viking. To make matters worse, at least a half dozen of the accidents included reports that the fuel gauges were either not functioning or were inaccurate—a double whammy for a complex fuel system.

We did feel for the pilot who, after sunset, requested that his Viking be serviced with 40 gallons of fuel. The fuel ticket showed 40 gallons were delivered and he paid for 40 gallons of avgas. The fuel gauges were not working. Shortly after reaching cruising altitude the engine quit due to fuel exhaustion.

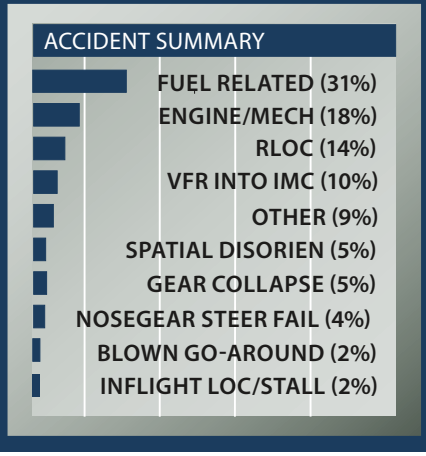
Following the forced landing that damaged the airplane but not the pilot, the investigation disclosed that the lineman who fueled the airplane had somehow put four, rather than 40, gallons into the wing.

Nonfunctioning fuel gauges were a symptom of what we felt to be a certain lack of enthusiasm among some Viking owners for maintenance. Nine accidents involved corrosion or bad welds on main landing gear and nosewheel steering components. Those led to gear collapses or abrupt excursions from the runway when the nosegear touched down.

There were 18 engine power losses, of which more than half were due to lack of maintenance or improperly performed maintenance. Examples included a corroded fuel manifold valve on a Viking that had been sitting for nearly two years and an oil filter adapter that was installed incorrectly causing an oil leak that lead to oil exhaustion and a seized engine.

There was only one inflight breakup of a Viking that we found—a pilot picked up a load of ice, lost control and got going so fast that the airplane came apart.

Pilot judgment was a factor in several Viking accidents: There were 10 fatal crashes involving VFR into IMC, an unusually large number for any type of airplane. Airport personnel warned one Viking pilot about poor runway condition so he decided to depart on the adjacent road. It seemed like a wise decision until shortly after liftoff when he hit a bush with a wingtip and spun to an abrupt halt.



ized Lycoming-powered 17-31TC and 17-31ATC. The "A" designates a type certificate change that increased the gross weight and added some other modifications. The most produced version is the 17-30A Continental-powered Viking. Early versions of the Viking had the IO-520-D. This changed to the IO-520-K in the early 1970s. The change is identified externally by the presence or absence of a cowling-mounted air filter under the crankshaft, which the IO-520-D has. In 1996 Bellanca added the IO-550-F to the type certificate. This change allowed the IO-550 to be installed on all 1979 and later airplanes without an STC. The main gear door STC, referred to as the four-piece door, was standard on production aircraft around 1973. Aircraft after 1992 have a factory-produced three-piece main gear door.

Starting in midyear of 1973 the fuel system was simplified by the addition of interconnect hoses, making the three tanks installed in each wing act as a single tank. These airplanes had a slightly smaller optional aux tank in the fuselage. The aux tank was downsized to gain more baggage space. In 1989 the fuel system was changed again to decrease the unusable fuel and add to the capacity. The wing tanks remained the same size, but an additional feed line was added that runs from the outboard tanks to the inboard tank and the vent, while reconfiguring the fuel return lines.

Air/oil struts were incorporated into the A-model aircraft as part of the gross weight increase. Some earlier aircraft have been upgraded to air/oil struts. In 1979 there were major changes forward of the firewall with the addition of cowl flaps and hydraulically actuated nosegear doors. The two-piece doors were added in 1976.

When shopping for a Viking, my advice is to bring it to a mechanic who knows Vikings. There are four Viking specialty shops scattered around the country. They are Weber's Aero in Alexandria, Minnesota, Rocket Aviation in Plainview, Texas, MARS in California and Pasquale Aviation (my shop) in Pottstown, Pennsylvania. Several of us have been working on creating publications to build the knowledge base among technicians and pilots. There's a video detailing how to properly inspect the Viking wings at tinyurl.com/ycetdwzd. We're

That's the Viking's steel tube framed roll cage pictured above. Tough, indeed.

also creating a prepurchase inspection document, similar to what ABS (American Bonanza Society) has for Beech models.

A concern with wood wings is rot. But wood rot isn't a widespread issue for properly maintained Vikings—and that includes keeping the wings dry. Consider that wood doesn't fatigue like metal does. All of the Viking wing failures were due to severe rot at the inboard end of the spars. This type of rot would have been prevented/detected if the airplanes had proper maintenance. Wood is the original composite structure. For the most part the wings are held together with resorcinol glue. Resorcinol has proven to be extremely durable and long lasting. It is not affected by chemicals or moisture, plus it differs from epoxy in that it isn't affected by heat. This allows Viking wings to be painted in any color without degrading the structural integrity of the wings. There is no service life limit on the Viking wings. Wood wings can be repaired by a skilled technician using common tools. I have done in-depth repairs to Viking wings such as spar splices and complete re-skin jobs using tools that can be sourced at a big box hardware

That's Ty Flippin's Viking, below. He said it can cruise at least 180 KTAS at 6000 feet burning around 17.5 to 18 GPH running rich of peak, but more typical is 170 to 172 KTAS on 13.5 GPH, lean of peak.

Dave Alger knows a little about Vikings. That's his fifth one, an IO-550-powered 1998 model pictured here. Dave Pasquale at Pasquale Aviation shows how not to get hosed when buying a Viking in his wing inspection video, below. Link to it on YouTube at tinyurl.com/ycetdwzd.

store. The repairs don't require the use of vacuum bagging and specialized heat sources. All gluing can be completed at room temperature. The downside: Glue repairs done by the inexperienced can lead to trouble and are a good reason to have a Bellanca specialized mechanic complete a prebuy evaluation.

As to fabric and paint, there are two weights of fabric used as the base covering material. The wings use a lightweight Dacron fabric; this used to be called Ceconite 104 and is now called Uncertified Light. The fuselage and flight controls are heavyweight Dacron, or Ceconite 101. For the most part this fabric can last the lifetime of the airplane, but it degrades from UV light. Complete fabric recovering jobs are generally the result of paint failure.

Plenty of factors affect the longevity of the paint on any fabric airplane. As the paint ages it cracks, which can be repaired (to a point). Eventually, they become so numerous that it makes more sense to start over and recover the airplane. Pay close attention to the overall paint condition, and find out if the airplane has been repainted recently. If the paint looks like alligator skin, it might be best to look at another airplane.

It might not make sense to buy a Viking in need of a recover because it simply costs a lot. I tell people it is similar to buying the airplane again because the base price for a recover at a Viking shop usually starts around $45,000. Add other tasks like painting the landing gear and installing mods, and the project gets pricey.

Beware of finish work shortchanged, done by simply sanding and painting the airplane. This often includes using an automotive urethane finish. The airplane will look great when it is finished, but the extra paint only accelerates the cracking the paint job was trying to hide.

As for parts, one of the best things about working on the Viking is very few parts require advanced manufacturing. This means the Viking is more field serviceable than many other airplanes and isn't as expensive.

A good example is the landing gear, with its welded steel struts. Occasionally a crack will develop along a weld, but most of the time I can have the crack repaired at my local welding shop that specializes in motorsports.

If a landing gear part is damaged beyond repair the factory, Alexandria Aircraft, still supplies parts and usually has them in stock. If it isn't in stock, they will make it for you. The turn time on most newly fabricated parts is generally a couple of weeks.

Perhaps the most desirable of the line are 1979 and newer airplanes due in part to increased cruise speeds afforded by the cowling and nosegear changes, while the IO-550 adds to the appeal of these airplanes because they are the fastest Vikings for operating between 7000 and 10,000 feet. The turbonormalized Vikings will do slightly better as the altitudes get well into the flight levels. However, I generally recommend getting a turbo if you need to operate in the flight levels. The maintenance can be intensive.

Dave Pasquale, Pasquale Aviation
Pottstown, Pennsylvania

OWNER COMMENTS

I currently have a 1998 Viking. It's one of the last Vikings built and has a Continental IO-550 engine. My first Viking was a 1969 model that I owned in a partnership. Since that we partnered on a 1970 model

Look quickly at the Viking's laminar flow wing and you could mistake it for the wing on a Cirrus. It's to thank for the airplane's speed and efficiency.

and in 1978 I bought my own 1976 model. The reason for that was I was getting carpal tunnel symptoms from constantly changing fuel tanks.

In 1980, I couldn't resist the temptation of the changes made in the Viking in 1979 and 1980 and purchased a 1980 model. This was probably the best-flying Viking I have had. I love flying the 1998 model for the IO-550 engine and all the instrumentation it has, and I have 4200 hours in it, but it is not quite as precise as was the 1980 model.

For equipment it has a Garmin GNS430, Shadin fuel computer and a Shadin altitude management system, ADS-B Out with a BendixKing KT74 transponder, Garmin GDL52 for ADS-B In data, PS Engineering audio panel, an S-TEC 60-2 autopilot, electronic tachometer, a standby electric vacuum pump and Pulselight LED landing lights.

In the five Vikings I have had I have over 8000 hours total. In nearly 50 years of flying Vikings along with other high-performance singles, I have to say that it is a most enjoyable aircraft to fly. It is steady in turbulence, strong, acceptable to being fully loaded and handles like a sports car and not a station wagon. The systems are quite simple by comparison and parts are readily available. The online Viking owner's forums are ready to offer great suggestions to any query. If there is one niggling criticism I have it is with the nosegear vibration. The basic problem is that it has reverse caster which leads to "wobbling" if everything is not just right. Rocket Aviation has been able to correct it when it happens, but it is still an irritation.

I did an analysis of a four-year period from 2014 to 2017. I flew 831 hours in these four years. The average was $128 per hour. This includes all repairs, maintenance and new equipment purchased (all six ECI cylinders had to be replaced last year due to the AD on them). I also purchased a Garmin GDL52, GDL39, aera 660 GPS and a new transponder.

In the 8500 hours logged in Vikings, I have landed them on dirt roads, grass strips and gravel runways in the U.S., Canada and Mexico so I consider it a well-used airplane. There will always be the sidelong looks for it being a wooden airplane, but the high-quality workmanship both inside and out is unquestionable.

David Alger
via email

N9678E is a 1978 Bellanca Super Viking 17-30A. I purchased it in November 2016 with approximately 2100 hours on the airframe and 300 hours on the 300-HP Continental engine. This is the second Super Viking I have owned; the first was a 1971 model which I enjoyed having from 2000 to 2002. It is important to keep the Super Viking in a dry, moisture-free hanger and as long as

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BELLANCA VIKING

(continued from page 31)

this is the case, the airframe should last virtually forever with proper maintenance. Moisture is not good for the wooden structure, just as it is not good for aluminum structures of conventionally constructed aircraft.

I have not found N9678E to be any more expensive to maintain than any other single-engine, high-performance retrac. It's important to have a mechanic who is familiar with the annual inspection procedures (especially for the wings), but all other systems like the landing gear are typical to a Bonanza, Mooney or an Arrow.

There are several shops across the country that specialize in the care and maintenance of Super Vikings and in addition, some very active online forums, where there is a truly vast wealth of information available to the owner/pilot.

I paid $42,000 for N9678E. Since the purchase, I have had the propeller overhauled ($3200) and have upgraded the avionics to include an L3 Lynx NGT-9000 for ADS-B In and Out ($7600), a Garmin GTN650 navigator, a GMA345 audio panel and a GI-106B CDI ($16,700).

These new components, coupled with a three-axis autopilot, give me a very capable IFR certified platform for a fraction of the investment of a Bonanza, Mooney or Commander 114, as a few examples, while enjoying very similar performance. With an instrument rating and 350 hours in type, my annual insurance premium is about $1600.

From a performance standpoint, I flight plan for 150 knots and 15 GPH at 23 inches of MP and 2300 RPM. The 300-HP Continental engine is somewhat thirsty, but I chose the Super Viking because I wanted a lot of excess power to get up and out of my airport, which is located in an area of limited off-airport landing sites.

The handling characteristics are superior in every respect. The smooth, laminar flow wing makes for very responsive control inputs while at the same time offering a very stable instrument platform. Some have equated the feel to that of a Ferrari as opposed to the truck-like feel of a Bonanza.

N9678E has a useful load of 1004 pounds. Most flights, I keep the aux tank empty so with 60 gallons onboard, that leaves 644 pounds left for passengers and luggage. With the aux tank filled, there is 75 gallons onboard, which translates close to five hours of flight time (without reserves).

My wife and I recently flew to Savannah, Georgia, from the Detroit, Michigan, area for a short vacation. With favorable tailwinds we could have made the trip without stopping, but elected to make one fuel stop.

Bottom line is your bladder will not last as long as the range of a Super Viking. While some would characterize the cabin as snug, it is larger than a Mooney, but not as spacious as a Bonanza or Commander.

I love this airplane. For the $70,000 investment, it's hard to beat the performance/cost/fun ratio. I would strongly encourage your readers to investigate the Super Viking if they are looking to upgrade to a high-performance, complex single engine.

It does require proper transition training as airspeed control is imperative (especially in descents) and with 300 horses up front, proper control inputs on takeoff are necessary. But oh, the smile that forms on your face!

Scott Kennedy
via email

FEEDBACK WANTED

PIPER PA46 SERIES

It's time for a fresh look at the used Piper PA46-series Malibu/Mirage/Matrix market in an upcoming Used Aircraft Guide in *Aviation Consumer*. We want to know what it's like to own these big singles, how much they cost to operate, maintain and insure and what they're like to fly. If you'd like your airplane to appear in the magazine, send us any photographs (**full-size, high-resolution please**) you'd like to share to the email below. We welcome information on mods, operating expenses or any other comments that can be helpful for buyers considering any version and vintage of the Piper PA46. Send correspondence by July 1, 2018, to:

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