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FIRST WORD

LATEST ADS-B DEALS: INSTALL KILLS VALUE

Amid all of the buzz surrounding the announcement of L-3 Aviation's low-cost NGT-1000 ADS-B solution, I've been talking with avionics shops to see just how realistic its estimated \$3000 installed price will be. You can read all about the entire L-3 Lynx ADS-B product line—which has plenty of options at multiple price points—on page 11 of this issue. But based on my discussions with experienced installers, L-3's entry-level NGT-1000 ADS-B Out system isn't exactly the cure-all for mass, mandate compliance, and that has as much to do with the real costs of installation as it does tightening competition. Good shops consider this, and so should you. An ADS-B project can be the perfect setup for sizable cost overruns and buyer remorse.

Moreover, when it comes to educating buyers of realistic bottom-line costs and cross-brand compatibility, the shops I spoke with confirmed my suspicions that manufacturers are falling short, leaving the shop with some explaining to do when a higher-than-expected price quote comes off the printer.

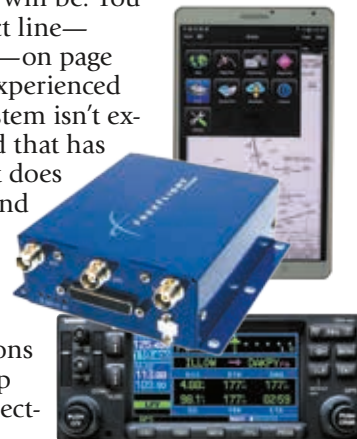
For instance, more than one installer noted that while BendixKing's KT74 1090ES transponder is advertised as a slide-in for an existing BendixKing KT76A/C transponder, that's hardly the case. The \$2999 KT74 does slide into the existing KT76A/C mounting rack and can use the existing power, ground and Mode C wiring, but the system requires connection to an approved WAAS GPS. The overall investment can easily top \$10,000 after installing a used Garmin GNS430W—a popular solution for such dilemmas. This snag isn't unique to the KT74—it applies to all 1090ES ADS-B transponder solutions, except L-3's new NGT9000. It comes equipped with GPS.

Since many ADS-B receivers will interface with a tablet computer (eliminating the need for a panel display), tablet apps have become a huge consideration when choosing a system. Before committing to an interface, ask if the system is compatible with your favorite tablet app and prepare for some compromise. There is a good chance you'll have to switch apps to accommodate the ADS-B interface. If hardware and software doesn't muddy the buying decision, NextGen GA Fund's plan for ADS-B market saturation might. It's like nothing I've seen in 25-plus years of industry involvement.

In case you haven't been following, NextGen GA Fund said it is buying 10,000 of the L-3 Avionics Lynx NGT-1000 ADS-B receivers as part of its Jumpstart GA 2020 program, even though it isn't taking delivery of any hardware. Shops can buy the equipment from NextGen GA Fund or from L-3. Its intention, it says, is to accelerate the industry's adoption of rule-compliant ADS-B Out avionics. Recall that NextGen GA Fund—which is managed by NEXA Capital Partners LLC, and is currently 100 percent funded by the private sector and not by the U.S. government—was going to eventually support over \$1 billion in avionics retrofit financing as part of the FAA Reauthorization and Reform Act of 2012. So far, no money has been released for lending.

The \$2521 Lynx NGT-1000 is one of the cheaper mandate-compliant UAT transmitters on the market (FreeFlight is announcing even cheaper solutions, which will include more hardware as standard.) The Lynx NGT-1000 was initially advertised to the public at the \$1599 dealer price, but the price has since been adjusted to include the installation kit and a configuration module.

Since the NGT-1000 doesn't come with antennas, these can easily add \$700 or more to the project. Plus, a \$1200 remote ADS-B control panel might be required if the aircraft doesn't have a Garmin GTX-series digital transponder. Add cabling, connectors, circuit breakers, flight testing and paperwork, and a NGT-1000 ADS-B Out installation could top \$5000—pricing that is competitive with ADS-B In/Out systems from Garmin, FreeFlight and NavWorx. One shop told me customers are blindly asking to place orders for the NGT-1000 to take advantage of the special introductory pricing. That shop smartly advised to put the brakes on and price the installation first.—Larry Anglisano



Avidyne Warranty

My airplane partner and I are upgrading the radios in our piston single to bring them into the present century and to comply with the ADS-B mandate. After much thought and discussion, we decided on Avidyne's IFD540 box you reviewed in the March issue.

Avidyne's AeroPlan extended warranty plan offers a "free" warranty extension for three years. However, to get the extension, we have to sign a "Waiver, Release and Indemnification" document that could bankrupt us.

It requires that we agree to not sue Avidyne after an accident involving our airplane and—get this—if there's a crash and someone else sues Avidyne, we have to pay all of the costs for Avidyne to defend the lawsuit and any settlement or judgment it has to pay.

We have had several attorneys look at the agreement. They all said, "Why would anyone in their right mind sign something like this?"

Our aircraft insurance broker told us that this was the worst thing he's seen in four decades in the business and that the aircraft owner can't buy any insurance that will cover him for the contractual liability he's taken on by signing Avidyne's agreement.

Name Withheld by Request
Via email

We reviewed the indemnity agreement that's required to enroll in Avidyne's AeroPlan extended warranty in the August 2013 issue of Aviation Consumer. Avidyne has a history of good customer service, which is why we simply cannot understand how it made a decision to impose a condition that could financially destroy a customer who signs up for AeroPlan.

To our knowledge, there is no company that will sell Avidyne's customers an insurance policy that will cover them should Avidyne get sued and demand that the customer step up and pay for Avidyne's costs under the indemnity

agreement. Figure hundreds of thousands of dollars just to get started.

We recommend that an owner who is considering joining AeroPlan get legal counsel before doing so.

TEMPEST STARTERS

In your March 2015 issue on aircraft starters, I didn't see anything about Tempest's PowerFlight starters. To my knowledge, there is no duty cycle limit (maximum cranking time followed by minimum rest/cooling time) as there is on the starters you reviewed.



Charles Davis
Via email

You're right; we managed to omit the PowerFlight line of starters, built by Tempest. The 14-pound starters come in 14- and 28-

volt models and are approved for most Continental engines. We were interested to find out that they are the only aircraft starter that does not have a duty cycle limit—according to Tempest's Greg Ehrlic, "You can crank the starter until the battery goes flat."

The PowerFlight starters use long-life brushes and a field-wound electric motor with no permanent magnets. They are designed for low internal friction and heat, so they can dissipate the heat generated during cranking without having to stop and wait a period of time if the engine does not start.

CHAMP V. CUB

I enjoyed the Cub vs. Champ comparison in the March issue. Imagine, we're still comparing the two after 70 years of service.

I must take issue with your statement, "Both the Cub and the Champ have an appallingly unsafe tank location." I believe that this is a statement of opinion that is not supported with either test or statistical data. Although it may seem intuitive to make this statement, there are actually many factors to be considered in the design of a crashworthy fuel system.

Tank location is only one of

those—and not necessarily the most important. I'm also fairly certain that neither Piper nor Aeronca considered any of the factors, but that doesn't mean the system is unsafe until proven otherwise. You do a disservice to readers by implying that a system is unsafe when, in fact, you have no data to support that.

Stephen Phoenix
Via email

While it's true there's little accessible data on crash forces in the Cub, it's also true that accident outcomes show that it has an exceptionally high rate of post-crash fire. A research study we did in 2000 revealed that of 24 fatal crashes, 14 or 58 percent suffered post-crash fires. Another recent sweep of the data confirmed those numbers. For comparison, more modern designs by Piper, Cessna and Beechcraft have post-crash fire rates in the 20 to 35 percent range. Modern airplanes like the Cirrus and the Diamond designs are much lower than that.

While it's not fair to compare the 77-year-old Cub design with a Diamond, we think it is fair to conclude from these broad numbers that the J-3 doesn't have a well-protected fuel system. Modern aircraft that have fuel tanks inside the cabin or fuselage—and there are some—tend to protect it in puncture-resistant plastic or Kevlar-armored tanks with armored lines.

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Engine Cluster Gauges: Repair or Replace?

That depends on its vintage and parts availability. For OEM replacement, Mitchell wins for quality and affordability.

by Jim Cavanagh and Larry Anglisano

Sooner or later you'll be faced with repairing or replacing an original-equipment engine or system gauge. It is impressive that many OEM manifold pressure, fuel flow, pressure and other gauges produced more than 60 years ago continue to function today.

But without regular maintenance, their accuracy could be compromised. One option is to upgrade to an all-in-one electronic engine display, but that requires a sizable investment that might be questionable for basic aircraft.

The cheaper alternative is to repair or replace an existing gauge. Here is a field report on available options and the limitations you might encounter.

TYPE-SPECIFIC

If you have to replace an individual gauge—that is, one that displays a

single function—remember that you can only legally install a replacement that is on the aircraft type certificate, or one that has PMA and/or STC approval.

Depending on the gauge's functionality, the aircraft might not even be airworthy if it's inoperative or missing from the panel. FAR section 91.205 covers which gauges need to be in the aircraft and functioning for VFR and IFR flight.

The replacement process goes beyond selecting a gauge that has appropriate certification. While a TSO certification could deem the gauge airworthy, it likely won't have the precise operating range markings applicable to your specific aircraft. Some shops can rework the dial and add custom markings that match the operating range specified in the aircraft POH. In most cases, you'll



CHECKLIST



Mitchell cluster gauges can be configured based on panel space.



Beware of noncertified automotive gauges. They might not be airworthy.



Service parts for vintage gauges are becoming scarce, limiting repairs.

have to provide the shop a copy of this data from the aircraft POH.

Further complicating replacement and repair options (but simplifying pilot workload), manufacturers began putting gauges in clusters, both to save panel space and to simplify the pilot's scan. At a glance, you can check critical engine and system parameters without peering from one gauge to the other.

Cluster gauges used in many popular planes built after 1950 come in different configurations, from assemblies of up to 10 rectangular-faced gauges, to round gauges with two or more integral functions. In larger aircraft, perhaps a twin-engine model, the gauges might be round and simply installed in a group and not in a cluster. In general, the more systems on an airplane, the more gauges in the cluster. Some display engine and mechanical info, while some clusters include more complex fuel quantity gauges that are switchable to display the fuel quantity in multiple fuel tanks.

While individual gauges are somewhat easier to service, cluster gauges require some thinking. Their fit, arrangement and their design are specific, plus aftermarket modifications can be difficult and unsightly. Replace one gauge in a cluster and you might have to modify other gauges to get all of them to fit. This was a problem Cessna faced a few years ago as the parts supply for

While service parts aren't exactly plentiful, field support for vintage OEM cluster gauges like this one on the bench at VIP Instruments in Connecticut is still pretty good.

older gauges dwindled. While the gauge might cost \$300, for example, the extra modification work could double this.

REPAIRING

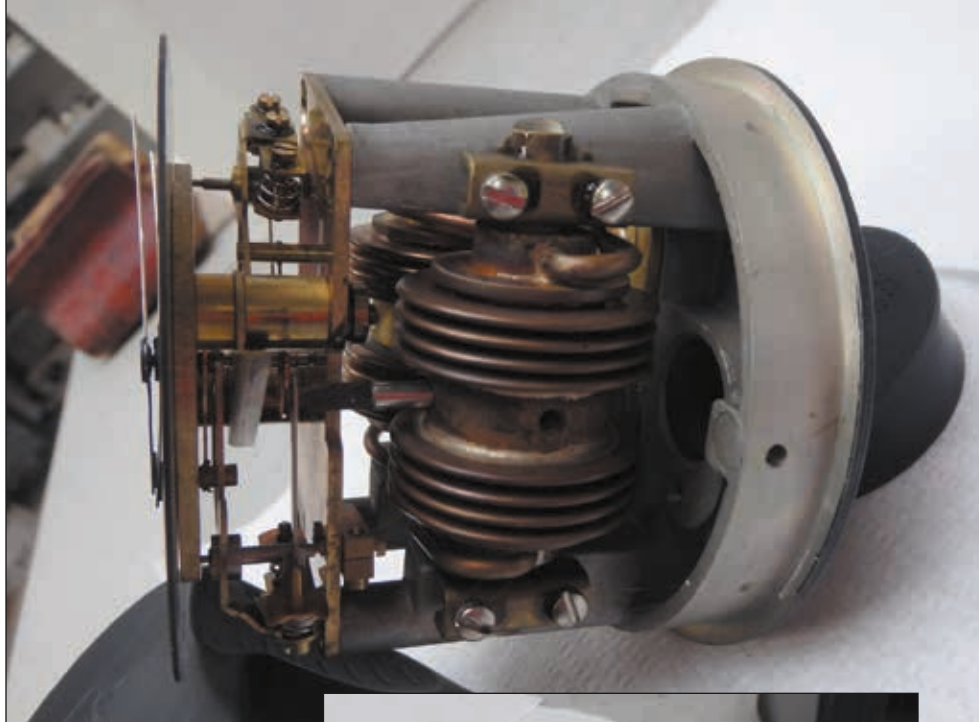
When it comes to repairing engine and system gauges, there are shops all around the country that have in-house capability. We talked to a few of them to get the skinny on dealing with old gauges. One thing we consistently heard was that the majority of the vintage OEM gauges are getting so old there are few if any available new replacement parts.

Bruce Gammon at Mid-Continent Instruments and Avionics in Wichita, Kansas, told us its repair lab has to evaluate an instrument before it can even advise an owner what to do. Gammon noted that most of Mid-Continent's work is repairing gauges (rather than overhauling), due to overall costs and the diminishing availability of service parts.

Like Mid-Continent, Bob Larsen with Air Parts of Lock Haven told us it buys as many of the older instruments as it can for sourcing extra parts. Of the cores Lock Haven takes in, many have usable parts that can be salvaged, cleaned or overhauled to create a like-new instrument.

Air Parts of Lock Haven has built a reputation for being able to do this quite well and affordably, based on feedback from end users and maintenance shops we spoke with. It is worth noting that this remanufacturing process is completely legal, as long as the shop is an FAA Repair Station.

VIP Instruments and Avionics in Hartford, Connecticut, has been repairing engine gauges and other instruments for over 30 years. VIP's Ed Rowley noted that while many customers send in instruments that are beyond economical repair, he can often source a like-replacement from another shop. Rowley said that while simple repairs and calibrations to many common gauges can be accomplished for around \$200—which is in line with other shops we polled—some can be far more costly if they require sensors, senders or other major components. The price goes up to around \$500 for an oil temperature gauge that needs a new capillary. The day we visited VIP, there was no shortage of repairs in progress, from



That is an original-equipment Beechcraft manifold pressure and fuel flow cluster gauge in the top and middle photos. The top photo reveals its internal barometer and pressure components, in addition to intricate meter movements. A vintage Cessna tachometer, bottom, freshly reworked by Air Parts of Lock Haven.



Beechcraft engine cluster gauges, to standalone tachometers and manifold pressure gauges from Cessna models, proving that repairing old gauges is a lively business.

If an owner is lucky, a shop will have an inventory of gauges ready for exchange. This swap might take just a couple of days or sooner with pricey overnight freight.

But a complex repair or an overhaul can take much longer—up to five or six weeks—if the gauge needs to be refaced with custom range markings. The other downside is that a refaced gauge might not match the other older gauges.

Interestingly, dismantling even larger instrument clusters reveals a



surprising level of simplicity. Manifold pressure and fuel flow gauges generally have no electrical connections, except for internal lighting circuitry, when equipped.

SOURCING REPLACEMENTS

If you have a certified aircraft, you can't replace a gauge with an automotive model. As noted, aside from not having a TSO, the dials are not

SELECT ENGINE GAUGE PRICES



GAUGE	FIT/APPLICATION	NEW PRICE
Mitchell tachometer	2.25-inch instrument cutout	\$200
Mitchell individual pressure gauge	1.50-inch square, stackable	\$100
Mid-Continent carb temp indicator	2.25-inch instrument cutout	\$636
United Instruments manifold pressure	3-inch round, no range markings	\$1075
Alcor EGT/CHT cluster	2.25-inch instrument cutout	\$579
Mitchell six-gauge mini cluster	Square, configurable in a cluster	\$750
Sigma Tek six-gauge cluster	1.44-inch square each in a cluster	\$3185

marked for a specific aircraft, although there are some exceptions.

Up until a couple of years ago, American Champion was using automotive gauges in its airplanes and the dials were marked externally with tape. This was fair game because the gauges were approved via the aircraft type certificate.

One problem is that round-style automotive gauges are 2.0 inches in diameter and aviation-specific gauges are designed to fit in a 2.25-inch

instrument cutout. For experimental applications, the smaller automotive gauges can save space.

One popular source for gauges is Wag-Aero (www.wagaero.com) in Lyons, Wisconsin. Wag has been keeping airplanes flying for years with economical alternatives, and it has a variety of gauges listed in its catalog, but not all are created equally. Wag-Aero's president Bill Read told us that Wag offers two categories of instruments: domestic and imported.

While many customers want products built in the U.S., some only care

Aftermarket Mitchell cluster gauges, left, are easily configurable. Those are Sigma Tek OEM gauges from a Grumman Tiger, lower right.

about price. "The imported gauges are available at a fairly significant discount compared to domestic ones. How much of a discount depends on the type and complexity of the gauge. Over the years, imports have expanded into more complex instruments," Read told us.

If you elect to buy Westburg/Westach instruments from a supplier like Wag-Aero, you need to be careful. Based in California, some of Westburg/Westach's instruments have a TSO, but the dial markings are comprehensive, not model specific. Its website says the instruments are made for a number of applications, including homebuilt aircraft. Pricing is reasonable, which confuses the buying decision. Wag-Aero used to brand its instruments under its own logo, but not any longer.

There are lessons to be learned from companies that no longer exist, some of which got into trouble by marking imported instruments as approved. Ultimately, the regulations state that it is the installer's responsibility to ensure correct markings and airworthiness.

Only two companies—Augusta, Kansas-based Sigma-Tek (www.sigmatek.com) and Richmond, Illinois-based Mitchell Aircraft Products (www.mitchellproduct.com)—offer direct-replacement cluster gauges. At one time, there were several OEM gauge manufacturers, including Stewart Warner.

Sigma Tek (it bought Edo Aire's GA division a number of years back) mostly deals with new instruments for OEMs. It built clusters for most of the later-model Cessnas, American General Tigers and others.

According to Sigma Tek's Jim Hearn, the economic crunch a few years ago forced Sigma Tek to downsize its distribution system, enabling shops and end users to buy direct. While Sigma Tek will repair or replace components in its gauge clusters, its forte is an exchange



business, something that can get the airplane back in service reasonably quickly and without rewiring.

While Mitchell specializes in creating replacement clusters, all of its instruments can be mounted individually, making it fairly simple to recreate one- to eight-gauge clusters without intricate wiring. Aircraft Spruce and Specialty sells rack housings for creating a custom cluster.

Mitchell's gauges are all electrical, using sensors and transducers to create the electrical signal for the dial. That means no fuel or oil flows in the cockpit.

Sigma Tek can create a completely new cluster, but it will take time and it will be fairly expensive since it has to fit the work in with its other tasks. Because Sigma Tek gauges are all built as components of a cluster, creating the cluster is a matter of building the case, wiring and interface plug. In older aircraft, this can require additional installation effort to rewire into the cluster's Cannon plug.

For standalone replacement gauges, Virginia-based UMA Instruments offers some TSO'd and PMA'd options, including oil pressure, fuel pressure, oil temperature and hydraulic pressure gauges at various prices, based on application.

CAVEAT EMPTOR

Whether standalone or in a cluster, vintage or modern, purchasing an as-removed or serviceable instrument from an avionics shop, a hangar neighbor or an aircraft salvage operation has some caveats.

A gauge purchased from a reputable source and with a signed FAA 8130-3 airworthiness form can offer peace of mind that it was tested, plus it offers traceability and supports a logbook entry. Salvage parts—and those purchased from a buddy or on eBay—may be less expensive, but can have a dubious history.

You need to be careful when buying used or salvaged instruments to ensure it is the correct replacement for the year, model and voltage of the aircraft. Even if the dials have the correct markings, the sensors and

ELECTRONIC REPLACEMENTS

If your avionics retrofit project has you paying the hefty price and dealing with the long downtime for a custom instrument panel, it's worth considering an electronic engine instrument display. For one thing, it can save sizable amounts of panel space, while placing critical engine data in a convenient location, compared to mechanical gauges that might be scattered about the panel. Plus, it will eliminate empty holes in the panel should you upgrade later on.



But don't assume you can ditch the old gauges. While entry-level systems from JP Instruments and Insight Avionics can display all of the parameters of a mechanical gauge (and more), not all functions are TSO- and STC-approved for primary replacement. The same rules that apply to mechanical gauge replacement also apply to electronic engine monitors.

While systems like the JP Instruments EDM 830 engine monitor can display manifold pressure, RPM, oil temperature, oil pressure and fuel pressure, in addition to cylinder and exhaust gas temperatures, it isn't approved for use as a primary instrument. That means you might have to retain nearly all of the existing primary engine gauges. But there are a number of all-in-one systems

that are approved for replacing most if not all of the primary mechanical gauges, including the JP Instruments EDM 930, the Electronics International CGR-30 and MVP-50 and the Ultra Electronics Auracle. It's worth mentioning that Electronics International has a variety of standalone digital gauges that might be used to replace mechanical ones.

If you commit to any of these primary engine displays, get ready for a sizable project with lots of disassembly, particularly when it comes to the fuel level interface. We recently witnessed such an installation that was underway at our local avionics shop. No fewer than three technicians were tasked with completely off-loading the fuel in the aircraft fuel tanks, while running new sensors and probes to various systems on the aircraft. The task means you'll want to have the system installed by a shop that has both avionics and powerplant technicians on staff.

Last, just because you opt for an all-in-one engine gauge system doesn't mean it's a free-for-all when it comes to locating the display. FAA Advisory Circular 23.1211 must be used as a reference for placing it. It recommends that a powerplant instrument be installed within a distance of 21 inches from the pilot's visual centerline to the center of the instrument.

If it can't be installed to those specs, the installation could require a master caution display, increasing the installation effort and the bottom line.

senders might not be compatible.

When it comes to cluster gauges, we give Mitchell high marks for reliability, durability, flexibility and for minding the budget. One Mooney owner installed 14-volt gauges in his 28-volt panel. Amazingly, the gauges became sluggish, and some insulation was charred, but the gauges functioned for over one year and were still accurate.

As for price, Mitchell replacements are far less than the cost of Sigma Tek models. This is mainly because of company infrastructure and the fact that Mitchell gauges have a far simpler cluster frame as-

sembly. A Mitchell six-gauge cluster is \$750. Compare that with Sigma Tek's price of \$3185. Since Sigma Tek is accustomed to working directly with OEMs, its gauges appear more sophisticated. Installation costs will depend on the condition of the wiring and how much disassembly is required to access the wiring.

Last, before surrendering to the shotgun approach to gauge replacement, we think it's worth sending the failed gauge to a reputable shop for evaluation and repair attempt. If you can live with the downtime, it could be the most cost-effective option if the parts are available.



Pipistrel Alpha Trainer: Light, Efficient, Innovative

Pipistrel has found a niche for a less expensive trainer that angles for predictably low operating costs and docile manners. An electric version is on the way.

by Paul Bertorelli

The notion that a basic training aircraft should be light, cheap and small has been dented by the advent of the 400 kilobuck Cessna 172, which is none of those things. But one of the companies that hasn't abandoned the minimalist trainer idea is Pipistrel, the innovative Slovenian aircraft maker

CHECKLIST



At \$83,181, the Alpha is one fifth the price of a new Skyhawk.



Thanks to obsessively light construction, the airplane has impressive useful load.



Handling, while good, is different from high-drag trainers. Accommodation is required.

that continues to plumb the bleeding edge of aero tech with new designs, one of which is the Alpha Trainer we'll look at in this review. An electric version may appear this year.

Cheap trainers have been tried before. Four decades ago, Cessna plied that market with the 150 Commuter and 20 years after that, Piper tried with the Cadet. What's new about Pipistrel's Alpha is that it's based on not just a light airframe, but an *obsessively* light airframe and one built with the lowest operating costs as line one in the design brief. In that sense, its competition may be not just LSA-type trainers, but the emerging diesel market, which, despite high purchase prices, claims low operating costs. At \$83,181 at current exchange rates, the Alpha is one-fifth the cost of new Cessna 172.

DIFFERENT STROKES

To say that Pipistrel marches to the tune of a different drummer suggests

that the company hears conventional music at all. We're not so sure. The Slovenian-based manufacturer builds a line of light aircraft and motorgliders that are decidedly off the mainstream. With efficiency as their driving force, Pipistrel's designs have been based largely on the glider or motorglider technology that's infused into the aviation culture of the region.

The Alpha Trainer is a downscale version of Pipistrel's popular Virus, a two-place highwing powered by a Rotax 912 and aimed at the sport flying market and customers who want both speed and economy. Those two are usually mutually exclusive, but thanks to Pipistrel's dedication to light weight and low drag, they manage it. We reviewed the Virus SW in the May 2012 issue of *Aviation Consumer* and found it to be somewhat of an exotic, long on speed, efficiency and good looks at the expense of some comfort. Even by European standards, it has a certain quirkiness to it.

Like the Virus, the Alpha Trainer is entirely composite. But instead of the light and strong honeycomb layup used in the Virus, the Alpha has a single-skin laminate to make it easier to repair in the field, says Pipistrel's Tine Tomazic. "Any glider repair shop would be able to work on the Alpha without special instructions or special facilities," he says. Furthermore, Pipistrel heard the complaints about LSAs not holding up to intensive training, so it has beefed up the landing gear structure and mount.

For occupant protection, the cabin is stiffened by Kevlar pillars and Kevlar is also used to build a cocoon around the fuel, which is located inside the fuselage aft of the small baggage compartment. The fuel tank is removable rather than having the wet-wing tanks in the Virus. That caused some maintenance headaches when trace methanol in the automotive gas the airplanes are approved for caused some tank damage. Now, in addition to being removable, the 13.2-gallon tank has an improved coating to prevent softening or delamination.

Showing its glider roots, the Alpha has high-aspect ratio wings and although it looks to have a huge wingspan, it's 34.5 feet, the same as the Virus SW. That's only two feet longer

than the Cessna 152. The Alpha has redesigned wingtips that make it look bigger than it in fact is.

But the wings are definitely different than those of the Virus. For one thing, they don't have the wing tanks and, second, the flap system is different. The Virus is unique for having a five-degree negative flap setting that's deployed in cruise to eke up the speed. They work, too; the Virus will boil along at 140 knots on about 3.5 gallons, making it one of the most efficient airplanes of any class.

Because of its slickness, the Virus has glider-type spoilers and if it didn't, landing would be difficult, especially on short fields. (Its glide ratio is 17 to 1.) Pipistrel dispensed with the spoilers in the Alpha and gave the airplane a higher flap setting for the second notch—25 degrees versus 18 in the Virus. This simplifies construction and operation and gives the airplane a steeper approach profile. Both aircraft have flaperons.

While the Virus is available with tri-gear or as a taildragger, the Alpha has only tri-gear and this means that unlike most LSAs, it has a steerable nosewheel and combined brakes operated by a hand lever, giving excellent ground handling. The nose-gear is steered via semi-stiff cables connected to the pedals and the rudder, so when the rudder moves, so does the nosewheel. The rest of the control circuitry is conventional torque tubes.

ULTRALIGHT IS RIGHT

When we flew the Virus SW in Slovenia three years ago and reviewed its numbers, the POH gave the empty weight as 302 kg or 664 pounds. We later emailed the factory to confirm that. Yup, that's right. Using the allowable U.S. light-sport weight of 1320 pounds, we calculated that the airplane could lift its own weight. Yes, said Pipistrel, it can, but to keep the stall speed down, the weight limit is 1235 pounds.

The Alpha we flew in Slovenia was even lighter. Pipistrel claims an empty weight of 287 kg (631 pounds) for a useful load of 264 kg or 581 pounds. Again, Pipistrel limits the max weight to 1212 pounds or 550 kg.

Still, with a useful of 581 pounds, the Alpha can carry two 225-pound

people, full fuel and about anything you could reasonably stuff into the baggage compartment. Those weights, by the way, include a ballistic parachute, a 13-kg (28.6-pound) addition that's standard and required in some countries.

These payloads should shut down any complaints about LSAs not being capable of carrying portly Americans. (By comparison, the ill-starred Cessna Skycatcher has a useful load of 486 pounds.)

To lift this prodigious load, the Alpha has the 80-HP variant of the Rotax 912. Other than the electric version (see sidebar), no other engine option is available. This has proved to provide sufficient power and it helps restrain the inevitable price escalation. To further tamp down the price, the airplane is sold complete; no options and a rudimentary panel and avionics suite.

True to form, the panel has some quirk to it, with instruments homegrown by Pipistrel, including clever combination analog/digital instruments for the ASI, altimeter, tachometer and clock. U.S. versions will have a Garmin aera, a GTR 200 comm radio, Garmin GTX 327 transponder, a 406 MHz ELT and a digital engine monitor. For a stripped-down trainer, that's fairly lavishly equipped, although it doesn't look that way once you're inside.

The interior is anything but lavish. The seats are adequately padded but not thick, nor are they adjustable. The airplane has comfortable seat



Alpha panel, above, has Pipistrel's homegrown digital/analog flight instruments and basic comm and navigation. Cabin, below, is wide, but not vertically spacious. Everything in the airplane is light and tight; rudder pedals, top photo, are adjustable.



ALPHA ELECTRO NEARS MARKET

In keeping with its cutting-edge ethos, Pipistrel has two ambitious electric-flight projects in the works. We covered the Panthera electric/hybrid project in the July 2014 *Aviation Consumer* and last fall, the company announced an electric version of the Alpha.

The prototype for what will be the Alpha Electro is called the WATTsUp. Pipistrel's innovative energy has caught the eye of the giant German electrical and electronics concern, Siemens AG, which is providing a high-power, light direct-drive DC motor for the electric Alpha.

The motor weighs only 31 pounds (14 kg) and has a maximum power output of 60 kW or about 80 HP, same as the gasoline model. Pipistrel's Tine Tomazic says that's by intention. The company wants the Alpha Electro to be identical in performance and load capability to the gasoline version.

As we go to press, the WATTsUp had about 55 hours of testing and Pipistrel expects to make a formal product announcement in Aero in April.

The biggest technical challenge to practical electrics remains battery capacity. Tomazic says the WATTsUP

is meeting its design goal of about 90 minutes of endurance with quick-change battery modules weighing a total of 126 kg or 277 pounds. Add it all up, the Alpha Electro will have a useful load of about 173 kg or 380 pounds.

With its limited endurance, the Alpha Electro is envisioned to be an airport trainer dedicated mainly to pattern work. Pipistrel thinks it should supplement a school that has a gasoline trainer or two. Although the batteries are quick change, Tomazic said it may make more sense for a school to have two electric airplanes sharing one set of spare batteries or to simply charge the batteries in place, which would require about 45 minutes. Pipistrel is aiming for a price of under €100,000, or about \$119,000 at current exchange rates. We hope to fly the airplane later this year. (Photos: Jean Marie Urlacher.)



in cruise and climb. "It was never conceived to be a quick airplane, but rather one with emphasis on takeoff and pattern, especially from very small fields," Tomazic says. Well, yes, but it will cruise at 108 knots on 3.5 GPH or less, smoking older trainers of this class. It's got three-hour legs, with reserve.

Pipistrel pays attention to the finer points of control harmony, so the

Alpha is pleasant to fly and quite docile. Steep turns, stalls and even aggravated stalls reveal no bad habits. Stall speed in landing configuration is a stately 37 knots.

Because it has clear acrylic cabin doors, visibility to the sides is fantastic and not bad

over the nose. The cabin is roomier than a 152; legroom is adequate for all but the tallest people, with adjustable rudder pedals to make up the difference. On our demo flight, we barely rubbed shoulders.

Landings in the Alpha are neither typical of small trainers nor LSAs. The airplane can't get past its glider roots, so a short, tight approach isn't in the offing, unless the pattern is flown at low altitude, and maybe not even then. Even with max flaps, the airplane just doesn't want to come down and slow down.

With the speed set at 55 knots, the view over the nose is good, but the approach is flatter than it is in other LSAs and certainly than in a 150 or 152. But it's easier to land than the Virus, which requires the use of spoilers and has less effective flaps.

Teaching in the Alpha would definitely be different than in a conventional metal trainer. A low-time pilot transitioning from one to the other might find the differences rather startling. But also less expensive, given the airplane's miserly fuel burn.

The Alpha was just being introduced when we visited Pipistrel for the first time in 2012 and has apparently found a niche as a trainer. About 80 have been sold worldwide, with about a dozen in the U.S. For more on the Alpha trainer and the Alpha Electro, check out Pipistrel's website at www.pipistrel-usa.com.

belts with dual shoulder harnesses, a plus in our view. And we think it needs them, because one thing we're not a fan of is the composite box hiding the spar carrythrough on the cabin roof.

It's directly in front of and only slightly above the occupants' foreheads. You'll graze it if not bump it when ingressing. Tomazic says the carrythrough is covered by a protective cushion, but when asked about the crash hazard this represents, he argues that it isn't a realistic hazard at all.

"It is there and it seems strange. But what people keep forgetting is that once you're strapped in, the pivoting point of the neck and head is actually at the shoulder level; there's no way your body will fly straight forward when it's restrained," Tomazic says. While this may be true, we

would rather it weren't there. But this is not an atypical limitation of small, light aircraft with limited structure and small cabins.

PERFORMANCE

You'd expect an airplane this light—even with 80 HP—to perform well and the Alpha doesn't disappoint. It handles well on the ground and although the takeoff acceleration doesn't pin you to the seat, it's brisk enough and the airplane leaps into the air and climbs well. It won't be a dawdler in the pattern.

In fact, the reverse is true. If you don't reduce the throttle smartly upon turning downwind, the Alpha will merrily accelerate to 100 knots or more indicated and will take some time and space to get to its 55-knot approach speed.

For a trainer, it's fairly fast, both

L-3 Lynx ADS-B: Scalable, WAAS Enabled

But even the entry-level model isn't the low-priced solution we've been waiting for. Put a sharp pencil on installation costs and the competition.

by Larry Anglisano

If you have been holding off on an ADS-B upgrade for lack of choices, go directly to the mother of all ADS-B comparison charts on page 14. The choices are plentiful, while the interface limitations and compatibilities are overwhelming.

Adding to the mayhem is L-3 Aviation's new Lynx ADS-B product line. L-3 says the MSS (for MultiLink Surveillance System) NGT9000 family of radio stack-mounted next-generation transponders is the primary market focus.

There are also several remote UAT transceivers in the Lynx MSS line, including the entry-level NGT1000 with its attention-getting \$2500 price.

SMART TRANSPONDER

Starting at \$6800, the NGT9000 is a Mode S Class A1/A1S transponder with a built-in WAAS GPS receiver, dual-band ADS-B receiver and has 1090ES ADS-B output. It's the first of its kind, particularly with a self-contained WAAS position source and a multifunction touch display.

The transponder comes in several models, including the base NGT9000, NGT9000D (dual-antenna, diversity-enabled model) and the flagship NGT9000D+, which adds an internal active TAS processor. It has an introductory list price

of \$11,933. The NGT9000+ has TAS, but not Diversity, and is \$9200.

L-3 is a pioneer in TAS and TCAS technology with its popular Skywatch and Skywatch HP products, so it's logical that TAS-equipped NGT9000 models can utilize existing Skywatch wiring and directional antenna. Those installations will benefit from the weight savings afforded by removing the large and heavy remote TAS processor.

An optional WiFi module enables wireless interface with iPad and Android tablets. L-3 has selected WingX Pro and SkyRadar for primary app compatibility, but says other interfaces are pending.

We like that the transponder supports multiple inputs/outputs, including ARINC 429, RS-422 and RS-232 serial data, plus discrete inputs/outputs for sensing whether the aircraft is on the ground or in the air.

While the architecture offers flexibility for cross-brand compatibility,

CHECKLIST



The Lynx 9000 has integral WAAS GPS and 1090ES output. That's a problem-solver for some.



Third-party panel display options are limited by proprietary interfaces.



Optional accessories could drive the cost of an entry-level NGT1000 project north of \$5000.

the interface is limited by software. Since the TAS processor (and ADS-B traffic output) emulates the proven Skywatch interface, it should be possible to interface to a wide variety of panel displays, including Garmin products. It is worth noting that Garmin screens will not differentiate between TAS and ADS-B targets—all traffic will be painted in TCAS-like symbology.

The NGT9000 will track both TAS and ADS-B targets simultaneously, but displays the most accurate resolution. In general, targets having ADS-B output might be more reliable over one being interrogated by TAS.

The Lynx Tail function offers the flight ID, ground speed and class of surrounding ADS-B traffic.

The NGT9000 fits in a standard six-inch-wide radio stack and measures just under two inches high and is a similar footprint as the Garmin GTX330ES, Trig TT31 and Avidyne AXP340 1090ES transponders. The NGT9000R is a remote version designed for integrated glass cockpits.

The Lynx MSS product line includes two configurations: The NGT9000 radio stack-mounted ADS-B multifunction transponder, left, and the NGT1000/2000/2500-series remote 978 MHz UAT transceivers, right.



But size is where the similarities end. Unlike the other 1090ES transponders which primarily have ADS-B output, the Lynx—with its dual-band (978 and 1090ES) ADS-B receiver—combines weather, traffic and navigation data on its color RGB touch display. Given the limitations of a bezel that measures under two inches tall, the device isn't the optimum way to monitor traffic and weather data, in our opinion. A tablet computer could offer additional utility.

The internal WAAS GPS requires a dedicated GPS antenna and can't be combined with an existing one. While Diversity models require a second directional antenna (for mounting on top of the aircraft), an existing Skywatch antenna can be used for Diversity and for TAS traffic.

The NGT9000 is controlled entirely by touch; there is no power switch. Instead, it powers on with the rest of the avionics when wired to an avionics master or battery switch. The system operates on 14 or 28 volts, making it a player for a wide variety of aircraft.

The data on the touch display is divided into left and right screens, which L-3 calls applications. You select each screen application using both drag and swipe actions, while basic screen position identifiers (hollow or empty circles) at the bottom of the screen show which page is active. Onscreen scroll bars navigate through lists or blocks of text, while slider bars are used for editing data

and for increasing and decreasing numerical values, for example.

Onscreen command buttons are typically a gray background color with white or green text. When a button is pressed, its background is highlighted in blue. The logic also makes use of momentary—to perform a onetime function—and latch buttons, which are tapped to set a single function to on or off. Gear-shaped option buttons are used to access available options for a given application screen. Simply tap the button to open the list of options.

Since the NGT9000 serves as a primary transponder, there is a dedicated transponder application that shares the left screen (by toggling) with traffic alerting. It contains transponder squawk code, IDENT-reply, pressure altitude read-out, transponder mode control (for selecting typical Mode A/C functions including altitude encoding), plus a MSG key that flashes when a new message is received. Simply tap it to view the message and tap Done to jump back to the application page. The ON-GND indicator advises that the transponder is operating in ground mode and isn't replying to all interrogations.

On a side note, there are multiple installation options for sensing ground and air mode status, include a weight-on-wheels landing gear sensor, an airspeed sensor switch, or by using the internal GPS groundspeed and altitude data. The unit requires pressure altitude input via a serial altitude digitizer or traditional Gray code altitude encoder.

It also has outputs for interfacing with compatible audio panels for traffic alerting and other prompts.

Multiple right-screen applications include a bird's-eye

traffic page, FIS-B graphics including NEXRAD radar, METAR, AIRMET, SIGMET and TFR data, all of which is overlaid on top of a basic map display.

The NGT9000 has a rich weather and traffic interface potential, and the sidebar on page 12 summarizes major applications. As we go to press, the NGT9000-series has not yet earned ADS-B TSO certification. L-3 says it has submitted the TSO request and expects approval later this spring. Installation approval will be governed by AML-STC.

REMOTE UAT OPTIONS

The rest of the Lynx family includes remote-mount 978 MHz UAT devices. These are all equipped with internal, mandate-compliant WAAS GPS receivers.

The \$3589 NGT2000 transmits ADS-B Out and receives ADS-B weather and traffic over the 978 MHz UAT frequency band. Through an optional \$270 WiFi interface module, weather and traffic can be displayed on an iOS tablet through the WingX Pro app and on Android devices with the SkyRadar app. Like the NGT9000, L-3 says it is working with other app manufacturers to expand compatibility.

The \$3856 NGT2500 has the same hardware and firmware/software as the NGT2000, but has an input/output protocol for interfacing with panel displays. This is where it gets sticky because many buyers will assume the device will play with an existing display, including the Garmin GNS430/530. It does not.

While the device outputs non-proprietary ARINC429, RS232 and RS422 data labels, it still relies on third-party software compatibility to solidify the interface. L-3 said it tested the unit on a Garmin-AT GMX200 and earlier MX20—a display that dates back to the Alaskan Capstone project—a time and place where the liberal, open architecture was created, but since abandoned by Garmin.

The \$2521 entry-level NGT1000 doesn't require a display because it doesn't have an ADS-B receiver. It does have a built-in WAAS GPS and is currently in certification, while the NGT2000/2500 are approved.

The NGT2500/2000/1000 products do not come with ADS-B or



The CP-2500 control panel, left, might add \$1500 to the project (after installation) if the aircraft is equipped with a legacy transponder.

LYNX TRANSPONDER APPLICATIONS AT A GLANCE

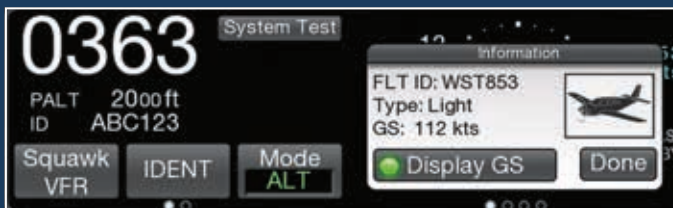


Clockwise from upper left: The FIS-B graphical winds and temperature application presents a basic moving map display with ownship position overlay (based on internal WAAS GPS position), plus the ability to selectively overlay winds and temperatures aloft at desired flight levels.

FIS-B textual data application shows AIRMETs, METARs, NOTAMs, SIGMETs, SPECI and TAF data. NEXRAD FIS-B radar can also be selected, while the age of the image is displayed at the bottom of the screen.

Lynx has an interesting traffic information data window which is accessed by tapping an onscreen traffic target. The expanded window shows a variety of information including the flight ID of the selected aircraft, the type of aircraft and its calculated groundspeed.

A dedicated traffic page shows a bird's-eye view of ADS-B traffic symbology. The NGT9000+ with internal TAS processor can use an existing L-3 Skywatch directional antenna and much of the existing Skywatch wiring. It also saves the weight of a remote Skywatch processor.



WAAS GPS antennas, so these need to be sourced by the installer. On average, this hardware could add roughly \$900 to a project, plus install.

The other accessory that isn't included with any of the Lynx UAT devices is the \$1223 CP-2500 remote ADS-B control panel. Since mandate-compliant ADS-B interfaces require that the ADS-B device transmits a squawk code and IDENT just as Mode A/C transponder does, the main function of the control panel is alerting the operator when there is a discrepancy between the two devices. It also enables the operator to manually sync the two.

Garmin's GDL88/84 series ADS-B systems eliminate the control panel with a self-contained low-power 1030 MHz transmitter that interrogates the transponder. The transponder reply enables both systems to remain in sync. In our view, this is a sizable advantage.

The control panel isn't required if the interface includes a Garmin GTX327, GTX330 or Avidyne AXP340 digital transponder, since this syncing is accomplished over the transponder's RS232 serial databus.

The control head shouldn't require much effort to install, since it is designed to fit in a standard 2-inch instrument cutout. But if the panel doesn't have an empty hole, the shop has to cut one.

CONCLUSION

The fly in the ointment is the Lynx's inability to display FIS-B data on common panel displays, at least not yet. L-3's Steve Rutherford is optimistic for future widespread compatibility, based on such success with previous interfaces.

"We believe the demand for Lynx will encourage the display manufacturer's to accept this non-proprietary signal and permit the data to display on multiple units. We experienced a similar situation when we developed SkyWatch and Stormscope to port data onto other manufacturer's displays (Garmin, Aspen, Avidyne), and the demand persuaded the manufacturers to accept the data," Rutherford told us.

We asked Garmin where it stands when it comes to participating in third-party ADS-B interfaces, including evolving solutions like the Lynx.

"Given there are no published industry standards for ADS-B display interfaces, we have developed our own proprietary interface which is only compatible with our own ADS-B products," said Garmin's Jessica Koss.

The basic NGT9000 transponder could likely top \$9000, after installation, while the TAS and Diversity-enabled NGT9000D+ could approach \$15,000. At these prices, we think the system will be limited to higher-end aircraft, particularly those that require 1090ES above 16,000 feet.

The \$2521 NGT1000 is an inexpensive mandate-compliant transmitter, but a complicated installation that requires the control panel and new antennas could yield a bottom line that approaches, if not exceeds, \$5000. For that reason, we think the NGT2000, Garmin GDL84 and FreeFlight RANGR 978 could be the better choices, as they will all display free ADS-B weather and traffic. The way we see it, the added capability lessens the sting of an investment that still isn't cheap enough to be a game-changer. Contact www.l-3lynx.com, 800-253-9525.

MANDATE-COMPLIANT, PANEL ADS-B PRODUCTS

PRODUCT	ADS-B SPECS	DISPLAY INTERFACES	PRICE	COMMENTS
ASPEN AVIONICS				
ATX200G	978 UAT OUT, DUAL-BAND IN	EVOLUTION MFD	\$5495	Has internal WAAS GPS receiver, available Q3 2015
ATX200	978 UAT OUT, DUAL-BAND IN	EVOLUTION MFD	\$1695	Requires external GPS position, available Q3 2015
ATX100	978 UAT OUT, 978 UAT IN	EVOLUTION MFD	\$3495	Requires external GPS, available Q2 2015
ATX100G	978 UAT OUT, 978 UAT IN	EVOLUTION MFD	\$4995	Has internal WAAS GPS, ADS-B In and Out
ARX200	DUAL-BAND RECEIVER	EVOLUTION MFD	\$1695	ADS-B In only, for use with 1090ES transponder
AVIDYNE				
AXP340	1090ES ADS-B TRANPONDER	N/A	\$3995	Partial plug-and-play with some existing BendixKing KT76A/C KT78A transponders, requires WAAS GPS input.
BENDIXKING				
KT74	1090ES ADS-B TRANSPONDER	N/A	\$2999	Partial plug-and-play with KT76A/C, KT78A transponders, requires WAAS GPS input
KGX130	978 UAT IN	IOS TABLET MFD TRAFFIC ONLY	\$1489	ADS-B In only, for use with 1090ES transponder
KGX150	978 UAT OUT, 978 UAT IN	IOS TABLET MFD TRAFFIC ONLY	\$4069	Has internal WAAS GPS.
KGX150	978 UAT OUT, UAT IN	IOS TABLET MFD TRAFFIC ONLY	\$3489	Version without internal WAAS GPS
FREEFLIGHT SYSTEMS				
FDL-978-TX	978 UAT OUT	N/A	\$2995	Has Diversity, includes control head
FDL-978-XVR	978 UAT OUT, 978 UAT IN	IOS, ANDROID MFD TRAFFIC	\$3695	Has Diversity, includes control head and WiFi module
FDL-978-XVR	978 UAT OUT, 978 UAT IN	IOS TABLET MFD TRAFFIC	\$4495	Internal WAAS GPS, includes WiFi module for tablet use
FDL-978-TX/L	978 UAT OUT	N/A	\$1995	Lite version, no ARINC card, upgradeable to ADS-B In
FDL-1090-TX	1090ES ADS-B TRANSPONDER	N/A	\$4495	Remote control head/processor design, requires WAAS GPS input
GARMIN				
GTX330ES	1090ES ADS-B TRANSPONDER	N/A	\$3995	Requires external WAAS GPS input
GTX33ES	1090ES ADS-B TRANSPONDER	N/A	\$5450	Remote version of GTX330ES
GDL84	978 UAT OUT, DUAL-BAND IN	IOS, ANDROID TABLETS	\$3995*	Standalone ADS-B Out and In, wireless Bluetooth connectivity with Flight Stream 110/210. Requires Garmin Pilot tablet app. *\$4495 with Flight Stream 210 (built-in AHRS)
GDL88	978 UAT OUT, DUAL-BAND IN	GNS530W/430W GTN750/650 G600/500 *IOS/ANDROID	\$3995	Requires WAAS GPS input, tablet interface requires Flight Stream wireless Bluetooth module and Garmin Pilot app
GDL88-W	978 UAT, DUAL-BAND IN	GNS530W/430W GTN750/650 G600/500 *IOS/ANDROID	\$5143	Has built-in WAAS GPS receiver, tablet tablet interface requires Flight Stream wireless Bluetooth module and Garmin Pilot app
GDL88-D	978 UAT, DUAL-BAND IN	GNS530W/430W G600/500 GTN750/650 *IOS/ANDROID	\$4495	Diversity model (requires top and bottom antenna installation), requires WAAS GPS input, tablet tablet interface requires Flight Stream wireless Bluetooth module and Garmin Pilot app
GDL88-WD	978 UAT, DUAL-BAND IN	GNS530W/430W GTN750/650 G600/500 *IOS/ANDROID	\$5643	Has built-in WAAS GPS receiver, Diversity (requires top and bottom antenna installation), tablet tablet interface requires Flight Stream wireless Bluetooth module and Garmin Pilot app
L-3 AVIATION LYNX				
NGT-9000D+	1090ES ADS-B TRANSPONDER DUAL-BAND ADS-B IN	SELF-CONTAINED, GARMIN MX20	\$13,384	Rack-mounted, internal WAAS, TAS, Diversity, displays traffic on any display that accepts Skywatch data
NGT-9000D	1090ES ADS-B TRANSPONDER DUAL-BAND ADS-B IN	SELF-CONTAINED, GARMIN MX20	\$9584	Has Diversity, but no internal TAS

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

PRODUCT	ADS-B SPECS	INTERFACES	PRICE	COMMENTS
NGT-9000+	1090ES ADS-B TRANSPONDER DUAL-BAND ADS-B IN	SELF-CONTAINED, GARMIN MX20	\$10,651	Has internal TAS, but no Diversity
NGT-9000	1090ES ADS-B TRANSPONDER DUAL-BAND ADS-B IN	SELF-CONTAINED, GARMIN MX20	\$8251	No Diversity, no internal TAS
NGT-2500	978 UAT OUT, 978 UAT IN	MX20, TABLET	\$3856	iOS, Android tablet interface requires \$270 optional WiFi module, \$1223 control panel may be required
NGT-2000	978 UAT OUT, 978 UAT IN	Tablet only	\$3589	Requires \$270 WiFi module, built-in WAAS GPS, could require \$1223 optional control panel
NGT-1000	978 UAT OUT	N/A	\$2521	Basic mandate-compliance, built-in WAAS GPS, could require \$1223 optional control panel
NAVWORX				
ADS600	978 UAT IN	Garmin MX20, GMX200 *GNS430/530/G500/600	\$1199	*Garmin display interface will overlay traffic only. \$2399 version with internal GPS can interface to 1090ES transponders
ADS600-B	978 UAT IN, 978 UAT OUT	Garmin MX20, GMX200 *GNS430/530/G500/600	\$2399	Has non-certified built-in WAAS GPS for aircraft that don't need to comply with ADS-B mandate
ADS600-BG	978 UAT IN, 978 UAT OUT	Garmin MX20, GMX200 *GNS430/530/G500/600	\$3499	Built-in mandate-compliant WAAS GPS, complete with antennas and installation hardware
TRIG AVIONICS				
TT31	1090ES TRANSPONDER	N/A	\$2568	Requires external WAAS GPS input, KT76A/C replacement
TT22	1090ES TRANSPONDER	N/A	\$2595	Remote control head and processor
TT21	1090ES TRANSPONDER	N/A	\$2345	Low-power transmitter version of TT22

NON-CERTIFIED PORTABLE ADS-B PRODUCTS

PRODUCT	PRICE	SIZE	ADS-B SPECS	BATTERY LIFE	MAJOR APPS SUPPORTED	COMMENTS
DUAL XGPS170	\$549	4.3 X 2.7 X 0.8	978 MHZ	5 HOURS	WINGX PRO, FLTPLAN.COM, SEATTLE AVIONICS FLYQ, ADVENTURE PILOT IFLY	Convenient chassis design with nonskid base
SAGETECH CLARITY	\$1150	2.5 X 2.5 X 1.5	978 MHZ 1090 MHZ	6 TO 8 HOURS	WINGX, ADVENTURE PILOT IFLY, GLOBAL NAV SOURCE, IPAD EFB, SKYVISION EXTREME	ADS-B only; no AHRS, dual band
SAGETECH CLARITY SV	\$1400	2.5 X 2.5 X 1.5	978 MHZ 1090 MHZ	6 TO 8 HOURS	WINGX, ADVENTURE PILOT IFLY, GLOBAL NAV SOURCE, IPAD EFB, SKYVISION EXTREME	Top overall performer for GPS, ADS-B and EFIS; smallest physical size; runs HOT
ILEVIL AW	\$1395	4 X 2.5 X 1.0	978 MHZ	5 HOURS	WINGX, FLYQ, ADVENTURE PILOT, AHRS UTILITY, XAVION, AVNAV EFB, AVARE	Can be be hardwired, pressure transducer interface for airspeed/altitude
ILEVIL SW	\$1195	4 X 2.5 X 1.0	978 MHZ	5 HOURS	WINGX, FLYQ, ADVENTURE PILOT IFLY, AHRS UTILITY, XAVION, AVNAV EFB, AVARE	Good performer; lacks dual frequency ADS-B
STRATUS II	\$899	6 X 2.6 X 1.25	978 MHZ 1090 MHZ	8 HOURS	FOREFLIGHT ONLY	Good overall value; runs coolest; requires toggling to separate app to use EFIS
STRATUS I	\$499	5.75 X 4.25 X 1.0	978 MHZ	8 HOURS	FOREFLIGHT ONLY	First-generation model, no AHRS, single-band receiver
GARMIN GDL39	\$599 \$699 W/ BATTERY	3.5 X 1.9 X 6.0	978 MHZ 1090MHZ	4 HOURS	GARMIN PILOT FOR IOS AND FOR ANDROID, GARMIN GPS396/496/696/AERA500 VIA CABLE, GARMIN 796	Bulky footprint, especially with optional battery installed
GARMIN GDL39 3D	\$849 \$899 W/ BATTERY	3.5 X 1.9 X 6.0	978 MHZ 1090 MHZ	4 HOURS	GARMIN PILOT FOR IOS AND FOR ANDROID, GARMIN GPS396/496/696/AERA500 VIA CABLE, GARMIN 796	Has AHRS output for driving Garmin Pilot attitude and synthetic vision display
NAVWORX PADS-B	\$999	7.0 X 4.0 X 1.5	978 MHZ 1090 MHZ	EXTERNAL VOLTAGE	WINGX, ADVENTURE PILOT, EKNEEBOARD	Transmits 978 MHz UAT ADS-B Out for more complete ADS-B traffic solution,
SKYGUARD 978UAT/1090ES	\$1475	8.0 X 3.0 X 2.0	978 MHZ 1090ES	EXTERNAL VOLTAGE	WINGX PRO, SKYRADAR, ADVENTURE PILOT, XAVION	First portable solution attempting to meet ADS-B mandate certification
SKYGUARD 978UAT/AHRS	\$1876	8.0 X 3.0 X 2.0	978 MHZ	EXTERNAL VOLTAGE	WINGX PRO, SKYRADAR, ADVENTURE PILOT, XAVION	Has iLevel AHRS sensor for attitude data

PILOT SERVICES



A screenshot showing the location of flight schools and FBOs that participate in OpenAirplane in the continental U.S. There are also participating operators in Hawaii and Alaska.

OpenAirplane: Rent While Traveling

OpenAirplane says a checkout at just one FBO allows a pilot to rent airplanes from other FBOs across the country. We tried it—it works.

by Rick Durden

When you're traveling and want to rent a car, so long as you're 25 or older, have a driver's license and a credit card, it's a piece of cake.

But for airplanes, almost without exception, the reality has been that if you want to do some flying while away from home base, you have to go through the local FBO or flight school's checkout to rent one of its aircraft. That means at least two or three hours and \$300 before you can take the family for a ride—a pretty daunting obstacle.

A CREATIVE APPROACH

In 2011, a businessman and pilot reared in the Internet age, Rod Rakic, wondered what he could do help get and keep more people flying. Teaming with software development wiz, Adam Fast, they brainstormed developing an Internet-based service that would allow pilots to rent more

airplanes in more places while protecting the companies providing the airplanes.

The result was OpenAirplane, which went live in 2012. It allowed pilots to rent airplanes all over the country based on one checkout (renewed annually). From six participating flight schools and FBOs (operators) initially, there are now 79, offering 260 airplanes for rent through the program. Some 9000 pilots have signed up.

Rakic told me that to set up a network of operators that would make their airplanes available for rent to pilots who hadn't gone through an in-house checkout, he had to come do three things: First, satisfy the operator that the checkout each potential renter had undergone was adequate; second, show the operator's insurer that the risk was acceptable and third, find a way of providing the "local knowledge" briefing a

pilot gets when coming in to rent an operator's airplanes.

Step one was solved using Rakic's experience as a Civil Air Patrol pilot. The CAP has had a standard, nationwide pilot checkout for decades—it's recorded on what's called a Form 5. The doctrine of standardization has worked for the military, airlines and CAP to assure that all pilots show an acceptable level of proficiency and safety. Rakic borrowed CAP's Form 5 and turned it into OpenAirplane's Universal Pilot Checkout (UPC) form. In fact, any CAP pilot with a Form 5 is automatically approved for OpenAirplane, no further checkout is necessary.

Rakic presented insurers with data that the accident rate for pilots current on a Form 5 checkout is 60 percent lower than for other general aviation pilots. Rakic also pointed out that pilots who have recurrent training annually rather than only biennially as required by the FARs, have a lower accident rate. The insurers were receptive to the idea of a higher level of safety among new customers for their insureds and got on board.

Finally, OpenAirplane's website includes a local knowledge briefing for each participating operator. It is created from the operator's answers to a 40-item questionnaire that is part of the process of an operator signing up for OpenAirplane. There

CHECKLIST



A single checkout allows renting airplanes throughout the country.



In-depth local knowledge briefings prepare renters for unfamiliar locales.



Standardized checkouts and renters insurance protect FBOs.

is no charge for an operator to become a participant in the program.

HOW IT WORKS

The premise is simple—a pilot signs up with OpenAirplane through its website, provides information on his or her experience and sends an electronic copy of the first page of his or her renters insurance policy (a basic level of renters insurance is required) and a credit card number—all flights, including checkouts, are billed through OpenAirplane's website.

Next, using the website, the pilot schedules a Universal Pilot Checkout at a participating operator. It's a thorough flight review (and results in a flight review logbook endorsement). Plan on about a 1.5-hour flight.

The UPC is good for one year with OpenAirplane. A UPC is valid for a particular type of airplane such as a Diamond Star, and it is limited to either the glass or round-dial cockpit version of the type. It can be for VFR day operations only or expanded to include night and IFR.

While the checkout must be renewed annually, once a pilot is approved for a type of airplane, he or she does not have to do subsequent annual checks in that type. For example, if the pilot is first approved for a round-dial DA-40 and takes the next annual checkride in a glass cockpit version, that pilot is approved for both cockpit versions of the DA-40. By taking subsequent UPCs in other types, a pilot can expand the spectrum of airplanes he or she can rent through OpenAirplane.

A UPC is good for all operators throughout the U.S., so long as they are on airports with a field elevation of under 5500 feet MSL. Above that, a mountain checkout is required (there is a mountain flying section on the UPC).

Because of the standardization of the training and checkout procedures within the Cirrus factory training program, OpenAirplane partnered with Cirrus last spring. A pilot current in the Cirrus program is automatically approved for that type in the OpenAirplane program just as are current Form 5 CAP pilots.

PAY ONLY FOR FLIGHTS

Signing up for OpenAirplane is free for a pilot or an operator. The only time a pilot pays anything is when

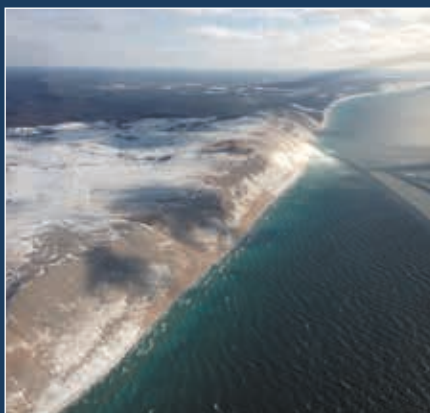
A MID-WINTER SCENIC RENTAL

The day of the rental I'd scheduled through OpenAirplane with Orchard Beach Aviation in Manistee, Michigan, was bitterly cold and deliriously clear. I'd reviewed the local briefing for Orchard Beach Aviation, nevertheless, on arriving at the airport it took me a few minutes to figure out the FBO was in the terminal building.

Once inside, after approaching the counter and indicating that I was there for an OpenAirplane rental, Rob Ericson handed me the airplane clipboard and pointed out

cliché says, I was good to go. The 1970s vintage 172 was in very good shape, with an only slightly dated IFR panel. The \$100 per hour rental price was lower than I was used to paying for an airplane of this capability.

I originally intended only a short flight but once aloft, the heater handled the single-digit temperatures easily and the day turned out to be so beautiful that I made a fairly long one along the Lake Michigan shoreline. I couldn't get enough of the view, including Sleeping Bear Dunes



the hangar where the airplane was parked, engine heater plugged in. There was no issue of me being some guy from out of town; I'd completed OpenAirplane's standardized Uniform Pilot Checkout—as the



National Lakeshore (above left) and the dramatic, ice-jammed harbor at Manistee (above right).

For \$140 I had a hassle-free rental over stunning scenery from an airport I'd never visited before.

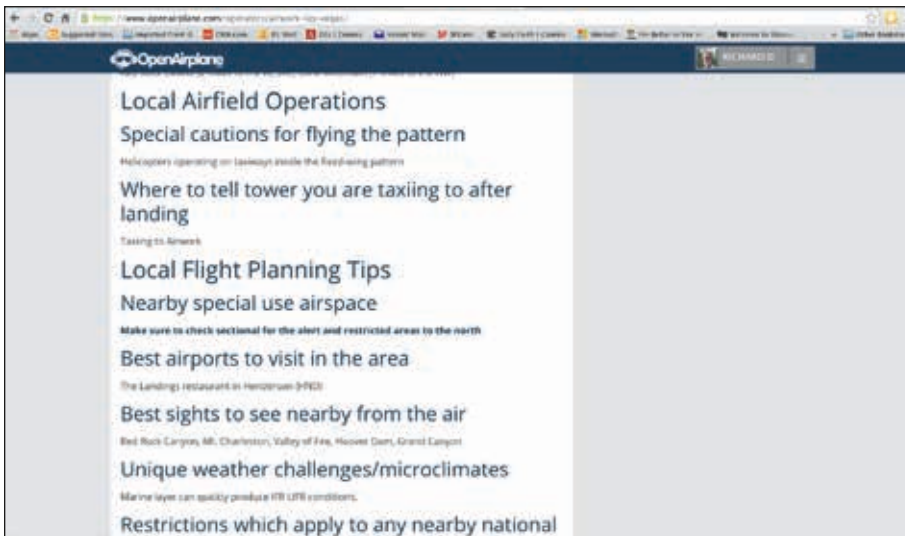
she or he flies. Rakic told me that he thinks there are too many ways to spend money in aviation without flying.

According to Rakic, the majority of the 9000 pilots who have signed up for OpenAirplane are using it to rent when they are on vacation. The procedure is designed to be simple. The website shows all of the participating operators nationwide, including Alaska and Hawaii. The pilot clicks on one in the desired areas and looks to see if it has an airplane he or she is approved to rent. The hourly rate for the airplane, wet, is shown (the hourly rate is set by the aircraft owner, OpenAirplane keeps 10 percent and pays the credit card transaction fee).

The pilot uses the site to put in a request to rent the airplane at a specific date and time for a designated period of time. The pilot gets an email either confirming the reservation or saying the airplane is not available and establishing contact with the operator to find a time that works.

Then, it's a matter of reviewing the website's local knowledge material as part of normal preflight planning and going for the flight.

Afterwards, the pilot records the tach and Hobbs times on the Open Airplane website. OpenAirplane communicates electronically with the operator to confirm the times and to see if there are any other charges such as headset rental or a



Screenshot of OpenAirplane page giving local knowledge and procedures for a participating flight school, Airwork Las Vegas.

chart purchase. OpenAirplane bills the pilot's credit card and pays the operator.

After the flight, the pilot is asked to evaluate the operator—and cannot do so until actually flying, unlike Internet user-feedback sites such as Yelp. The star ratings generated by OpenAirplane pilots for each operator are available to all other Open Airplane pilots (not the public).

The operator is also asked to rate the pilot after a flight. That rating is only available to the pilot and other OpenAirplane operators—not the public or other OpenAirplane pilots. It's a good motivator for the pilot to be a good renter.

GIVING IT A TRY

The program sounded straightforward to me, so I gave it a try.

My conclusion? It works well. It took me a while to figure the website, www.openairplane.com. There is a tremendous amount of information, but every once in a while I'd hit a dead end and have trouble figuring out how to get out of it. A search function on the site would help.

When I first signed up, there were no participating operators in my area (Colorado—there are now). With a business trip coming up, the OpenAirplane website pointed me at an operator about 30 minutes from where I'd be, Crosswinds Aviation in Howell, Michigan. Based on a review of what sort of airplanes were available through OpenAirplane nationwide, I decided on a G1000-equipped Cessna 172 checkout.

Once at Crosswinds, I was introduced to instructor Scott McDonald

who told me that I was the first checkout for the operator. Nevertheless, it went smoothly. We went through the UPC, spending a bit over an hour in discussion before going out to preflight the airplane. The airplane itself was in nice shape in a large, immaculate hangar.

The flight was what I would expect on a flight review, start out on a cross country, then a diversion, air work, emergencies, and takeoffs and landings. It was thorough and flying with McDonald was pleasant.

In the ensuing year, I was unable to find time to schedule an OpenAirplane rental, so my checkout elapsed. By then, Alliance Flight Training on Front Range Airport, east of Denver, was participating operator. I used the website to schedule another UPC, this time in a round-dial Cessna 172. Instructor Tim Sale was professional and thorough. His mountain flying experience added value to our session.

I then tried to schedule two Open Airplane rentals in Michigan. The website wouldn't do it—the system won't let you schedule unless everything in your profile is up to date. An email to OpenAirplane resulted in an immediate response that my profile showed my medical had expired. Rakic later told me that the website is being changed so that a pilot can more easily see what on his or her profile has expired and fix it. Once I provided the current data, I was able to schedule a flight in a Cessna 172 at Orchard Beach Aviation in Manistee, Michigan, and Troy Air Experience in Troy, Michigan.

After the flight in Manistee (see

the sidebar on page 17), I spoke with Orchard Beach Aviation's Rob Ericson about the OpenAirplane process. He said that the standardized nature of the checkout made it comfortable and that OpenAirplane was a way for them to potentially attract more customers in a popular vacation area.

Flight school Troy Air Experience doesn't have a lobby where one picks up the clipboard—the renter pilot gets a gate and hangar access key code and goes directly to the hangar. He or she never meets anyone from the operator. It's a little different, but the OpenAirplane local knowledge briefing and a phone call to Troy Air Experience had me ready to go even though the weather tanked.

In speaking to a number of participating operators, the comments of Matt Binner of Airwork Las Vegas echoed a common thread among them—he had an initial concern over allowing a pilot his operation hadn't checked out to fly their airplanes, but said the standardization in the checkout process helped solve that issue. The experience has been positive overall.

CONCLUSION

I think OpenAirplane is on the right track. Rakic and Fast have come up with an effective program for pilots who want to rent while on the road. Some may chafe at what amounts to an annual flight review requirement but, from a realistic safety and risk standpoint, it's about the minimum that insurers are going to accept.

If a pilot rents away from home plate twice a year, keeping an OpenAirplane checkout current is probably cheaper than taking dual at numerous locations. The rapid growth in participating flight schools and FBOs indicates some optimism about potential demand for the service and its long-term success. It certainly addresses a long-perceived need. On top of everything, I like using an aviation service that doesn't charge me for anything unless I actually fly. I'm planning to use the program again.

Aftermarket Oil Coolers: Aero-Classics Dominates

Don't assume your new or overhauled engine will include an oil cooler. Aero-Classics and NDM have a variety of new FAA-approved OEM replacements.

by Larry Anglisano

You wouldn't install a used oil filter on a new or overhauled engine, would you? Of course you wouldn't, and for the same reason, you shouldn't reconnect the oil cooler without replacing it, or at least having it properly serviced.

Often one of the most neglected components under the cowling, the oil cooler on your engine could be in desperate need of servicing, even if it's not begging for attention by dribbling oil on the hangar floor. Luckily, there are relatively inexpensive replacement and overhaul options that might provide insurance against premature engine wear. Let's have a look.

MANY SHAPES AND SIZES

Reassembling a radiator, an oil cooler has rows of air fins separated by narrow oil passageways. On the inside, the oil flows through the oil passages and is slowed by a turbulator plate, dispersing the oil while radiating heat into the air fins—subsequently radiating heat into the ambient airflow.

On larger Continental engines, the oil cooler is mounted directly to the engine, while Lycoming engines connect to remote coolers. The obvious advantage to the direct-mount Continental design is its lack of external oil transfer hoses, a source of potential leakage. Still, engine-mounted coolers live harder and shorter lives because they sustain more engine vibration than firewall-mounted remote models.

Most specialty shops told us the average lifespan of an engine-mounted cooler can be around 10 to 12 years. Common failure modes

include stress cracks and corrosion-induced leakage. Remote coolers can live as long as you, but only if serviced regularly and properly.

A hard failure isn't the only reason to service or replace a cooler. The other concern is blockage. By nature of its design, the oil cooler makes for an effective secondary filtration system, catching carbon, metal and other engine contaminants. Simple flush-cleaning probably won't do it much good.

Wayne Thomas at Pacific Oil Cooler Service in La Verne, California (and the sister company of oil cooler manufacturer Aero-Classics) described the time-consuming cleaning process it performs on a cooler during overhaul.

After ultrasonic cleaning, each cooler spends time on three different flushing machines. High volumes of Stoddard solvent flush at high pressure—with reversing direction of flow every 60 seconds—is the key to thoroughly flushing a cooler. The final flushing bench has a 10-micron filter screen that is carefully monitored until the cooler is clean. Coolers are run on each of three flushing benches in two-hour stints.

"We recommend the oil cooler be overhauled once every three or four years, at the end of the engine's TBO cycle, or any time any major engine

Most Lycoming engines use a remote oil cooler like the Aero-Classics model, top photo, while the majority of coolers for Continentals mount directly to the engine, bottom.

CHECKLIST



Pacific Oil Cooler Service has a thorough, money-saving overhaul process.



Remote oil coolers have a long lifespan, but still require professional cleaning.

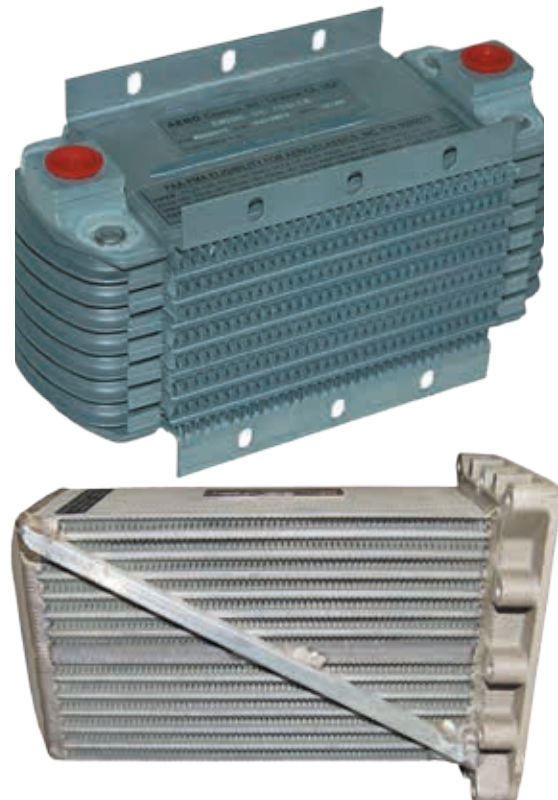


A lower-quality engine overhaul might not include an overhauled cooler. Ask if it does.

work is being performed," Thomas said. Of course, if the cooler is damaged, replacement might be the only option.

In general, coolers that are mounted on the front of the engine and closer to ram air inlets are more susceptible to air fin damage from debris impact.

When it comes to total replacement, like oil filters, there is hardly a one-size-fits-all solution. Aside from bolt patterns and remote mounting, there are congealing and non-congealing design. A non-congealing cooler has an additional oil input flow hole to allow constant warm engine oil to flow through it at all times, even if the oil cooler verma-



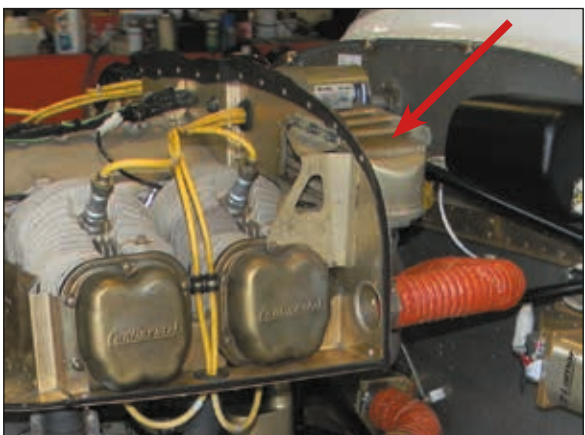
SELECT OIL COOLER PRICING

BRAND	APPLICATION	OVERHAUL EXCHANGE	NEW EXCHANGE
Aero-Classics	Cessna T210 TSIO-520-L	\$745 (\$300 core)	\$1688 (\$200 core)
Aero-Classics	Piper PA28R-200 IO-360-C1C	\$235 (\$50 core)	\$476 (\$25 core)
NDM	Beechcraft C23 O-360-A2G	n/a	\$317 outright
Aero-Classics	Beechcraft Bonanza N35 IO-470-N	\$325 (\$100 CORE)	\$626 (\$50 core)
NDM	Piper PA32R-301 IO-540-K1G5D	n/a	\$479 outright

therm (thermostat control valve) is in bypass mode at cold oil temperatures.

Consider that oil in a vermathem-equipped engine, oil doesn't flow to the oil cooler unless it's at least 160 degrees F. When it does, the couple of quarts of cold, thickened oil trapped in the cooler will be slow to flow out the other side and into the

A tech at Pacific Oil Cooler Service puts a cooler through a three-stage flushing process during overhaul, top photo. The Continental engine on this Cirrus, bottom photo, houses the cooler at the rear, protecting the fins from inlet debris.



engine, creating a blockage. It might be possible to upgrade to a non-congealing model by replacing the mounting hardware and vermatherm.

WHAT SHOPS SAY

There doesn't seem to be a favorite cooler to install, although shops report that Aero-Classics dominates for FAA-approved replacements for vintage coolers that are no longer available. This includes exact replacements for Stewart Warner, Harrison and others sourced through OEMs. The shop's main concern is finding a supplier that has a wide variety of coolers in stock and ready to ship. Pacific Oil Cooler Service in La Verne, California, is the name spoken by every shop we spoke with.

"When overhauling a Continental engine—and the cooler being part of the engine—we send the cooler to Pacific Cooler," said Charlie Melot at Zephyr Aircraft Engines in Zephyrhills, Florida. Melot noted that while a remote cooler on a Lycoming isn't part of the overhaul, Zephyr still sends it to Pacific for overhaul.

That's what we wanted to hear. Why invest in an engine overhaul (or major internal engine work) only to connect an oil cooler that's contaminated with metal and sludge?

As for sourcing a replacement, the oil cooler market is confusing. Aside from Stewart Warner, the Harrison Radiator division of General Motors made a variety of coolers before selling off the tooling and manufacturing rights. Today, the manufacturing of most FAA-approved

direct-replacement coolers are by Aero-Classics and Niagara Thermal Products (NDM), distributed by Niagara Air Parts.

Niagara Air Parts says it can't distribute NDM coolers for Continental engines (NDM sells direct to Continental.) Instead, it reversed engineered its own under Canadian certification, including an STD'd aluminum replacement for the Harrison cooler on Piper Super Cubs.

Niagara's Ronald Newburg doesn't believe in oil cooler overhaul. His opinion is that no matter how extensive the cleaning process is, you simply can't wash all of the contaminants from its nooks and crannies. For that reason, his company only sells new replacements. Niagara has a warehouse in Niagara Falls, New York, and takes pride in having a lot of stock ready for quick shipping.

It's confusing that parts supply catalogs list a variety of cheaper models, including non-FAA/PMA-approved coolers manufactured by Meggitt Troy. While these can replace old Harrison/South Wind coolers in Beech, Mooney and Cessna applications, they require field approval—a process shops generally avoid.

Based on our research, they'll select an oil cooler based on its easy replacement. While there are huge variations in fit, Aero-Classics, MDN and Niagara are the preferred choices. Expect to pay several hours' of labor for replacement.

If you decide to have the oil cooler serviced instead of replaced, we think Pacific Oil Cooler's extensive overhaul/cleaning process is better than an ineffective flushing—and much better than doing nothing at all.

CONTACTS

Aero-Classics Heat Transfer Products
909-596-1630
www.aero-classics.com

Niagara Air Parts
800-565-4268
www.niagaraairparts.com

Pacific Oil Cooler Service
800-866-7335
www.oilcoolers.com

Dynon's WiFi Interface: Simple, Dirt-Cheap

Using a USB WiFi device, Dynon makes it easy to connect its SkyView avionics suite with ForeFlight's iPad app. Better yet, it only costs 35 bucks.

by Larry Anglisano

Why make it complicated? The easiest and cheapest way to connect an iPad with panel avionics is to create a portable, plug-in WiFi network. That's precisely what Dynon has done with its \$35 miniature WiFi adapter.

Garmin, Aspen, FreeFlight and others have wireless interfaces, but they all require FAA-certified wired transmitters that mount in the bowels of the aircraft. That can't be done for \$35, but Dynon can by using its secure WPA2-protected WiFi link. The thumb drive-sized device has an integral wireless transmitter, while new operating software enables connectivity with ForeFlight's Mobile iPad navigation app.

HOW IT WORKS

The WiFi interface is compatible with all SkyView and SkyView Touch systems that have the current version 12.0 operating system. One WiFi adapter is required for each SkyView display in the aircraft.

Each adapter plugs directly into an existing SkyView USB port, usually installed on the instrument panel—

the same port used for software updates and system configuration. The adapter must be installed before powering up the SkyView and remaining in place throughout the flight.

The interface is compatible with ForeFlight Mobile version 6.7, and requires a \$174.99 ForeFlight Mobile Pro-level subscription. Connectivity between the iPad (or iPhone) and the SkyView is established exactly as it does with any WiFi network. Simply look for and select the Dynon network in the iOS WiFi Settings page.

ForeFlight receives SkyView's WAAS-enabled GPS position, in addition to ADAHRS-based attitude data for flight instrument overlay. If the ForeFlight subscription includes synthetic vision, it too can be overlaid on the Dynon's ADAHRS data. The GPS data can be used as a position source for an iPad without

CHECKLIST



Finally, a panel WiFi connection that doesn't require a wired module.



ADAHRS output overlays flight data on ForeFlight's synthetic vision display.



We wish Dynon's ADS-B data can play on ForeFlight, and so might Stratus 2 ADS-B users.

internal GPS, eliminating the need for an external GPS receiver.

Flight plan data is transferred from the app into the Dynon display by opening the ForeFlight nav log, and then touching the Send To and Panel icons. SkyView automatically refreshes the active leg, syncing the two systems together.

The interface uses the ForeFlight Connect wireless function, which also connects the app to the popular Stratus 2 ADS-B receiver. If you fly with the Stratus 2, you'll have to choose which system you want to display because the iPad is limited to one network connection at a time.

Unless you have two tablets, you will have to swap between networks (Dynon and Stratus) to display ADS-B traffic and weather on the iPad.

What is missing is an interface between Dynon's SV-ADSB-470 ADS-B system and the ForeFlight app.

Contact Dynon at www.dynon-avionics.com, 425-402-0433 and ForeFlight, www.foreflight.com.

The Dynon WiFi adapter connects the SkyView display, far left, with ForeFlight's iOS app, top. Flight plans are loaded to the Dynon with the app's Send To Panel command, lower right.



Garmin GDL69 SXM: Price ADS-B Instead

Garmin has a replacement for older GDL69 XM receivers, but upgrading to the GDL88 ADS-B receiver could be a better long-term strategy.

by Larry Anglisano

As we've been reporting, SiriusXM Aviation is delivering its next-generation datalink weather products (supplied by WSI) over its latest G4 satellite network. The benefit is more weather products included in the entry-level subscription package. The downside is that older receivers won't work with the newer G4 network.

If you have one of these first-gen XM receivers, including Garmin's popular GDL69 and GDL69A, it continues to receive XMWX weather from provider WxWorx, but for how long is anyone's guess.

Garmin has an upgrade path with the GDL69/69A SXM system, its next-generation Broadcast datalink receiver that will drop in to an existing first-gen GDL69 installation. That's good news if you're willing to pay full price, which starts at \$3875. But it's an investment that approaches the cost of a full-up ADS-B install—with the benefit of free weather data.

HARDWARE, DISPLAYS

The chassis of the new GDL69 SXM receiver is identical to the original box, measuring 6.15 by 1.05 by 7.20 inches and weighs 2.83 pounds. The receiver uses the same Garmin GA55 GPS-style antenna as the older unit, so shops won't have to disassemble interior components during a swap-

out. The wiring is similar, connecting to the display over a serial or ethernet databuss.

The SXM is compatible with a wide variety of Garmin panel displays. This includes the GTN750/650 touch navigators, GNS530W/430W and legacy (non-WAAS) GNS navigators, the G500 and G600-series PFD/MFD systems, G1000, G950 and G900X integrated avionics, plus the GMX200 and legacy MX20 MFD. The GDL69 SXM isn't approved compatible with other brands.

Consider that while the GDL69 SXM will receive all of the weather products in a given subscription package, your particular display might not support it all.

For example, SiriusXM's \$34.99 per-month entry-level Pilot Express subscription includes the delivery of base reflectivity radar, NEXRAD storm cell attributes, radar coverage map, observed lightning strikes, TFRs, winds aloft (including graphical depiction), AIRMETs, SIGMETs, PIREPs, temperatures aloft, forecast winds, METARs and TAFs. But a GNS530/430W will only display NEXRAD radar, METARs, TAFs and TFRs. That leaves you paying for data you can't use. Newer displays,

The Garmin GDL69 XM receiver, standing vertical at the upper right, is packaged in a similar chassis and uses an antenna that is the same footprint as the WAAS-equipped GDL88 ADS-B transceiver, lower right. That makes replacing a GDL69 with a GDL-88 ADS-B system straightforward.

CHECKLIST



The GDL69 SXM receives SiriusXM's lower-priced subscription packages.



Some existing GDL69 wiring can be used with a GDL88 ADS-B retrofit.



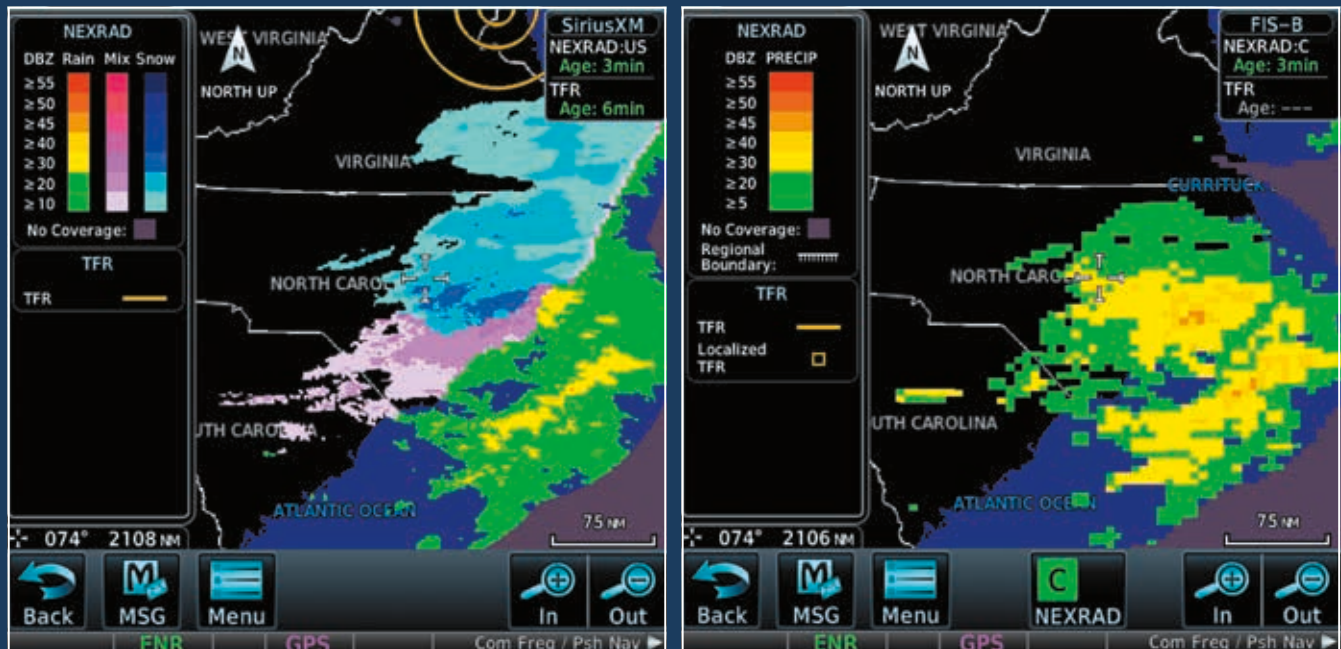
There is no trade-in allowance for existing GDL69 receivers. That hints at obsolescence.

including the GTN750/650 and the G600/500 can support SIGMETs, AIRMETs, PIREPs and turbulence data.

A way to get more out of a GDL69 SXM might be Garmin's Flight Stream wireless Bluetooth interface. It takes the GDL69 SXM wireless, displaying on an iOS or Android tablet. This eliminates the need for a panel display, an alternative for older MX20 interfaces that are known to crash when overloaded with XMWX graphics. You'll have to use Garmin's



SIRIUSXM, ADS-B RADAR COMPARED



The Garmin GTN750 screenshots above compare NEXRAD images as delivered by SiriusXM satellite, left, and FIS-B ADS-B uplink, right. While WSI is the weather provider of both datalink products, there are some obvious and considerable differences. Note that both screens are displaying the same NEXRAD returns, at three minutes old, and at a 75-mile map range.

Compared to SiriusXM, a sizable limitation of FIS-B is its inability to differentiate between liquid and frozen precipitation. When compared to Broadcast radar imaging, FIS-B radar has a more blocky appearance, due to its lower resolution. For bandwidth-limited FIS-B, the resolution of displayed continental U.S. (CONUS) NEXRAD is approximately 10 kilometers, or 5.4 nm. For regional NEXRAD (within 500 miles of the aircraft location), resolution is two kilometers, or 1.09 nm. We asked SiriusXM about the resolution of its radar, but it said it doesn't share those details.

The bottom line: if you regularly use Broadcast radar to tactically pick your way through areas of dense precipitation, switching to ADS-B weather could limit your mission. But for steering clear of precipitation that you simply don't want to fool with, we think FIS-B data gets the job done—for free.

Pilot app—not a bad thing—but if you're loyal to another app, you'll need to transition. We covered the Garmin Connex and Flight Stream wireless interface in the August 2014 issue of *Aviation Consumer*.

UPGRADE STRATEGIES

Even if you make the switch to FIS-B weather data, you can still have SiriusXM with the SXAR1 portable weather and audio receiver. But again, you'll need to switch apps. It plays with WSI's Pilotbrief for iPad, a weather-intensive app, but with limited flight planning and flight display capabilities, compared to other apps.

As for the longevity of first-gen receivers, SiriusXM's Craig Correa told us that "SiriusXM is not announcing any changes to the XMWX broadcast at this time. We will communicate any future changes as soon as they are known. Hopefully this will allay concerns of any abrupt or near-term

changes to XMWX availability." We still think older receivers are on borrowed time.

Garmin recently introduced the \$600 GXM42 portable next-gen SiriusXM receiver. It works with its portable GPS models, another solution—if you can deal with its old-school wired connectivity.

Speaking of wiring, we suspect the thought of any installation, no matter how simple it may be, might deter some GDL88 upgrades, especially for buyers still sitting on the ADS-B fence. For them, a while-you-wait GDL69 SXM drop-in has appeal.

We asked a couple of shops for back-of-the-napkin pricing to transition from a GDL69 to a GDL88. Although the final invoice will greatly depend on the condition and complexity of the aircraft, most thought that it could be accomplished in one working day. That's for a basic nonpressurized airframe with clean

wiring. Best case, that translates to \$1000 of labor. The GDL88 with internal WAAS GPS has a list price of \$5643. If you don't need the model with WAAS GPS (and many applications that have a GDL69 already have an approved ADS-B position source), the GDL88 starts at \$3995. After equipment discounts, that could yield a full-up, mandate-compliant GDL88 ADS-B interface for around \$4800. There is also the lower-priced GDL84, requiring the Flight Stream hardware, which starts at \$700.

The GDL69 SXM is \$3875, while the GDL69A SXM with entertainment is \$4795, with antenna.

Bottom line? For buyers that can live with lower-resolution FIS-B radar, we think a GDL88—with free weather and traffic—could be the better forward-thinking solution.

Contact www.garmin.com, 800-800-1020 and www.siriusxm.com/sxmaviation.



Aviat Husky

A rugged taildragger that performs equally well in the outback, on the water and on an instrument approach.

Utility airplanes occupy an interesting market niche. Like any other airplane, they take off and land, cruise at altitude, carry a payload and offer some creature comforts. Naturally, just about any spam-can does that and probably can do it faster, more economically and with more pampering of the pilot and passengers. But unlike most other airplanes, utility airplanes are optimized to use short, unimproved fields without drama or damage, carry lots of stuff, require little maintenance and be field-repairable, just a few of the features with which the typical tricycle-gear, all-metal single has trouble.

Over the years, types like Piper's Super Cub, the Maule series and the American Champion Scout have come to exemplify a utility airplane. All three were originally designed decades ago and have changed little since, fully depreciating their design and engineering costs. Too, there's little "wrong" with these models: They ain't broke, so they don't need fixin'. Put another way, the basic piston-powered utility airplane is mature technology.

Into this niche came the Aviat

(formerly Christen) Husky, unapologetically designed with the Super Cub firmly in mind. The result is a Part 23-certificated, well-built and good-performing airplane successfully competing against its forebears. In fact, its success is all the more remarkable

In the hands of a qualified pilot, the Husky can be a good neighbor, even at busy airports with a mix of traffic.

since it was designed and certificated in the 1980s, something of a dark age for new general aviation designs.

Utility airplanes, of course, are put to many different uses, including romantic bush flying, plus more mundane pursuits like pipeline patrol, law enforcement, ranching and even training. By all accounts, the Aviat Husky tackles all these challenges with equal aplomb, making it worth consideration by anyone looking into buying a utility airplane.

HISTORY

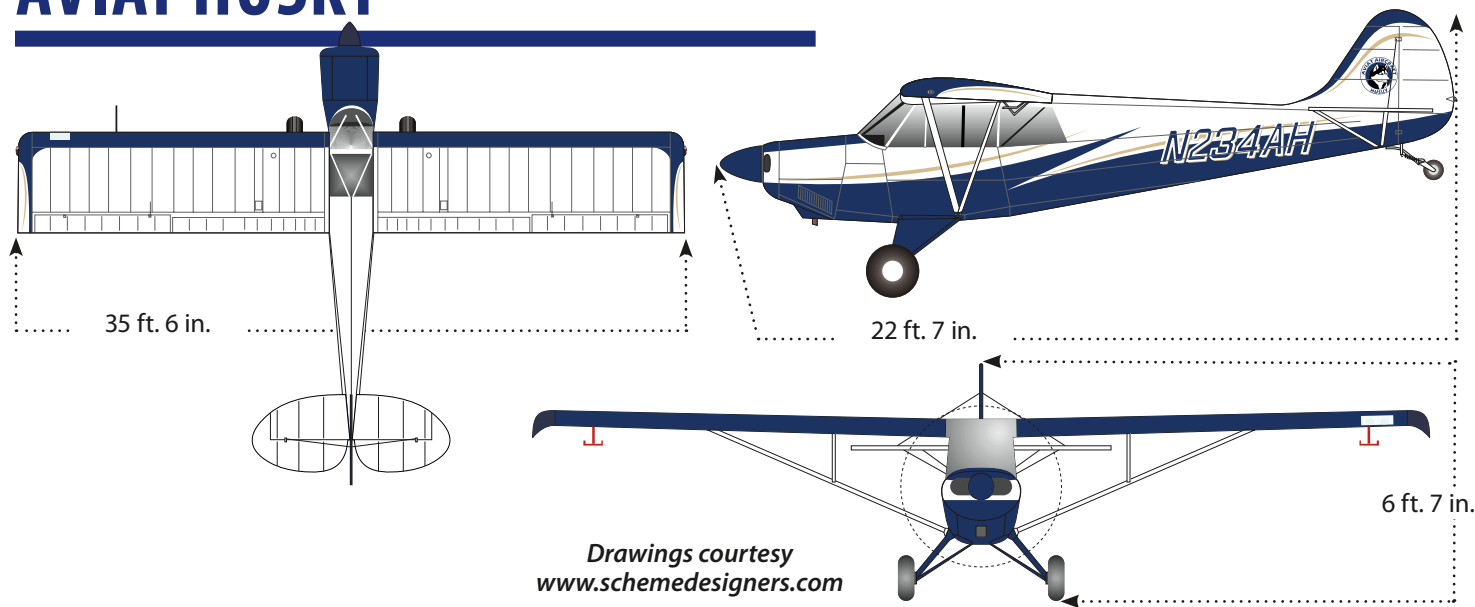
Christen entered the market in the early 1970s, making specialized ac-

cessories—inverted oil systems, fuel pumps and restraint systems—for aerobatic airplanes. The company's products have been of uniformly high quality. Lycoming liked the inverted oil system so much it bought the system and offered it as a factory part.

But building aerobatic airplane components wasn't enough; Christen branched out into the homebuilt market with the Christen Eagle, a highly capable kit-built aerobatic biplane in the mold of the Pitts Special. The Eagle was significant in many ways, not least for its highly professional, complete and detail-oriented kit packaging, complete with an extensive, step-by-step manual. This approach to building airplanes—packaging them as extensive kits—is now commonplace. At the time, however, homebuilding was generally a matter of buying plans, renting a hangar, ordering materials and figuring it out yourself.

Chris McCrank's 2006 A-1B, main photo, reliably serves a dual mission of cross-country travel and playing in the back-country.

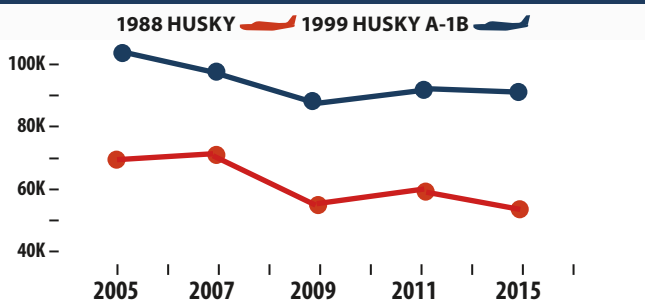
AVIAT HUSKY



HUSKY MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1988-89 HUSKY	180-HP LYC O-360-C1G	2000	\$21,000	52	610	122 KTS	±\$ 55,000
1990-93 HUSKY A-1	180-HP LYC O-360-C1G	2000	\$21,000	52	610	122 KTS	±\$64,000
1994-96 HUSKY A-1	180-HP LYC O-360-A1P	2000	\$21,000	52	610	122 KTS	±\$69,000
1997-99 HUSKY A-1	180-HP LYC O-360-A1P	2000	\$21,000	52	610	122 KTS	±\$79,000
1999-02 HUSKY A-1A	180-HP LYC O-360-A1P	2000	\$21,000	52	610	122 KTS	±\$84,000
1999-01 HUSKY A-1B	180-HP LYC O-360-A1P	2000	\$21,000	52	610	122 KTS	±\$87,000
2002-05 HUSKY A-1B	180-HP LYC O-360-A1P	2000	\$21,000	52	610	122 KTS	±\$108,000
2006-08 HUSKY A-1B	180-HP LYC O-360-A1P	2000	\$21,000	52	610	122 KTS	±\$130,000
2010-13 HUSKY A-1C	180-HP LYC O-360-A1P	2000	\$21,000	52	925	122 KTS	±\$185,000

RESALE VALUES

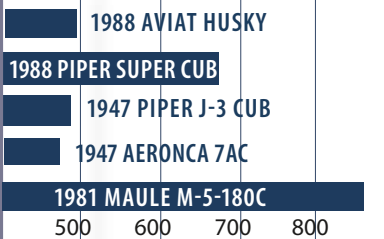


SELECT RECENT ADS

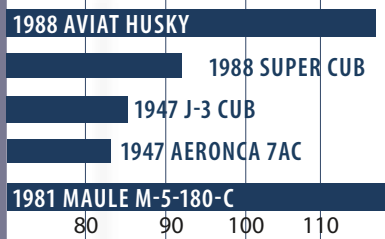
- AD 1991-23-02** CARBURETOR AIRBOX REPLACEMENT
- AD 1990-2025** FRONT SEATBACK WELD INSPECTION
- AD-97-04-03** ENGINE/PROP AD HARTZELL PROPS EDDY CURRENT INSPECTION
- AD 88-22-07** ENGINE AD/LYCOMING O-360 TYPE CYLINDER FROM ECI

SELECT MODEL COMPARISONS

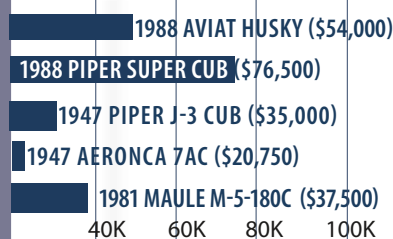
PAYLOAD/FULL FUEL



CRUISE SPEEDS



PRICE COMPARISONS





Like a Cub, you ungracefully egress and ingress a Husky from the right side of the aircraft, upper photo. The instrument panel is large enough to accommodate enough avionics for advanced IFR machines, although some radios end up under the panel, lower photo.

Recognizing the market for aerobatic airplanes is small, Christensen nonetheless had a factory, a workforce skilled in building tube-and-fabric airplanes, and a family of solid, proven products. But, he needed a new product and saw opportunity in the bush plane market.

At the time, the only competitor being manufactured was the Maule and—despite that company's seeming immunity to the ills plaguing the rest of the industry from time to time—precious few of them were rolling out the doors. After trying to buy rights to the Super Cub, the Champion line and the Interstate/Arctic Tern, Christensen reportedly considered the asking prices (including the assumption of product liability for previously produced airplanes) unrealistic.

The answer? Build an all-new airplane. Christensen and designer/engineer E. H. "Herb" Andersen,

Jr., determined they could develop and certify their own design at lower cost and in less time than buying and producing an existing product. So that's what they did, bringing the initial A-1 Husky from conception to FAA certification in 18 months.

Since the costs of development and certification have stopped many would-be aircraft manufacturers dead in their tracks, this tale says something about the company's management. Equally revealing is the amaz-

ingly short time it took to bring the Husky to market. Even so, the Husky didn't set the world on fire: Only 68 were produced the first year and an average of 30 to 40 annually since.

The initial 1800-pound A-1 model was replaced by the A-1A and A-1B in 1999. The Husky A-1A featured a 90-pound gross weight boost, to 1890 pounds, while the A-1B's gross was 2000 pounds. To this point, all three models mounted a carbureted 180-HP Lycoming O-360 engine, turning a Hartzell constant-speed prop. That's in contrast to an unmodified Super Cub, with its 150 HP and a fixed-pitch prop.

Both the A-1A and A-1B were produced until the 2002 model year, when the A-1A was discontinued. In 2007, Aviat obtained FAA certification of the A-1C Husky, which features a 2200-pound gross weight, an increase of 200 pounds over the A-1B. Structural modifications included new landing gear, a five-leaf tail spring, a new wing with extended flaps and spade-less ailerons, plus a new wing-flap control handle.

Additionally, according to the FAA type certificate, the new model's CG envelope was "reduced forward and expanded aft." The A-1C comes with a choice of the standard 180-HP O-360 or a fuel-injected IO-360 Lycoming pumping out 200 HP. The A-1B has been discontinued as of the 2008 model year, ushering in the current-production A-1C.

KEEPING IT SIMPLE

When designing their new airplane, Christensen and Andersen kept one eye focused sharply on the Super Cub. The pair's design objectives included good short- and rough-field performance; ruggedness, accessibility and serviceability to simplify support in primitive conditions; outstanding slow-speed handling coupled with docile stall characteristics; good endurance and reasonable cruise capability.

By all accounts, they succeeded: The Husky is a conventional two-



In 1982, Frank Christensen purchased the Pitts type certificates, along with the factory, effectively cornering the contemporary market for aerobatic biplanes. Thanks to better-performing monoplane designs from builders like Extra and Sukhoi, the Pitts/Eagle domination of aerobatic competition's upper end is no more. But, the Pitts was star of the show for a time; it remains viable and continues in production, as does the Eagle kit.

tandem-seat taildragger that, frankly, looks just like a Super Cub. That's not a bad thing: The Super Cub has remained popular for decades, for good reason.

In terms of materials and structure also, the Husky is straightforward. The fuselage is welded 4130 chrome/moly tubular steel with a full-depth aft fuselage for greater strength. Except for the A-1C-200, the aircraft is powered by either a Lycoming O-360-C1G (early models) or an O-360-A1P (1993 and later models). This Lycoming is widely acknowledged to be almost indestructible. The engine cowling and forward fuselage are skinned with aluminum. The aft fuselage and flying surfaces are covered with polyester; the seams are taped with cotton and fastened to the structure by oversized pop rivets.

One clear advantage new-airplane designers have is the ability to examine similar designs and correct any shortcomings cropping up over time. For example, rather than the problematic wood spars Champion used, the Husky's wings employ dual aluminum spars and aluminum ribs. They are supported by fore and aft struts, which were designed to eliminate corrosion and other problems encountered over the years in a large number of strut-braced airplanes, including certain Piper and Taylorcraft models, for example.

To facilitate maintenance, a Husky's nose bowl is split to permit its removal without touching the propeller; the cowl has large doors on either side for easy engine compartment access (good for preflights). Moving aft, the fuselage is metal-clad to the end of the cabin and features several removable panels. The aft fuselage, which includes the battery bay, is accessible through a large panel on the port side. (A baggage door was optional, so not all have one.)

The landing gear is conventional in more ways than one: It uses reliable, proven bungees for shock absorption, and mounts them inside the fuselage to reduce drag. The brakes are good and the track wide, which helps ground handling. Tundra tires are a popular add-on, making soft-field and rough-country operations much simpler.

For other terrain, all A-1s are built with float attach fittings installed. The only additions required for straight



or amphibious float operations are lifting rings and a ventral fin. For the same reason, dual-puck brakes—required for the tundra tires—are standard on all aircraft. These brakes are quite good and offer plenty of stopping power. Meanwhile, the Husky is approved for both retractable and wheel-replacement skis, as well as for banner or glider tow hook installation.

Changes made to the line since the first A-1 rolled out the door have been incremental improvements, largely as a result of real-life service experience. To its credit, Aviat has designed all improvements to be field-retrofitable to existing airplanes. Since early models can be updated with the later improvements, there is no better or worse model year. As a result, one of the keys for any prospective buyer is ensuring all desired mods and any mandated changes have been performed, and to be careful of overall condition.

HANDLING

The Husky's non-tapered wing comes with Fowler-type, slotted flaps hinged to move aft as they are deployed. Even at full—30 degree—deflection, they provide more lift than drag, making



With plenty of power to get off the water, the Husky makes for a decent floatplane, top, turning respectable 100-plus-knot cruise speeds at altitude. The Hartzell carbon fiber Trailblazer propeller mod, lower photo, allows continuous full-power operations at 2700 RPM, along with improved climb performance.

for good short-field performance. Elsewhere on the wing, attention has been paid to the ailerons, as well. They are symmetrical in section, and the leading edge has a larger radius than the wing trailing edge it abuts to maintain attached air flow during low-speed and high angle of attack flight.

Counterbalanced aerodynamic spades hang from the bottom of the aileron leading edge on models through the A-1B; they were elimi-



Approaches to landing at backwoods areas like Chamberlain Basin in Idaho is what the Husky does best, top. While the Husky isn't a bad choice for low-time tailwheel pilots, it demands attentive rudder control. The resale market has no shortage of good, low-time models perhaps given up by transitioning pilots bitten by groundloops.

nated on the A-1C. Borrowed directly from the four-aileron Pitts, the design permits full roll authority well into the stall.

Of course, any airplane designed for utilitarian purposes should be a straightforward, forgiving airplane to fly. Although it can demand some extra effort to extract all its performance, the Husky meets these objectives by all accounts. Thanks to the good aileron and rudder authority, combined with the Fowler flaps, the

pilot really has to provoke the Husky to get it to bite.

Anything resembling proper stall technique results in very mild stalls and near-instant recovery. Spins are virtually impossible to get into with flaps deployed. But, when flaps are retracted, it will reward uncoordinated control input with a snap over the top in power-on stalls. It won't spin, but the resulting spiral or corkscrew maneuver can be alarming.

Speed builds very quickly during this exercise, and must be attended to immediately. However, almost any reaction leads to recovery. Also, during cruise in turbulent air, speed control is important at most altitudes, since indicated airspeed is fairly close to the VNO of 103 knot indicate. (VNE is 132 knots.)

After exploring stalls, a new Husky pilot will find slow flight and STOL performance are areas where the Husky really shines. Takeoff distance with full flaps is 200 feet; landings

require only 350 feet. Figure about 500 feet total over an obstacle. Even at high density altitude, liftoff speed is reached quickly and the effective brakes help make short stops easier. The best technique for assuring the airplane will stay on the ground is to retract the flaps during the brief landing roll.

Even maximum performance takeoffs result in continuous climb. There is no sagging-off even while flaps are retracted. It is a credit to the airplane that, once a pilot is familiar with it, such performance does not require superior technique. We found that it's not necessary to lift the tail during takeoffs: The airplane simply doesn't need it.

No-flap takeoffs require more ground run, naturally, but taking off in the three-point attitude produces a short run and healthy climbout (1500 FPM at sea level at the best rate of climb speed of 63 knots). Wing loading is light at 9.8 pounds per square foot, so the ride in turbulence can be bumpy. It's an inevitable trade-off for STOL performance.

On approach, precise control of airspeed and vertical speed are important to achieve this kind of performance. Just as when flying any airplane close to its performance limits, the correct combination of alignment, sink, airspeed and attitude can be elusive at first, but once mastered results in truly impressive STOL performance.

In the hands of a qualified pilot, the Husky can be a good neighbor even at busy airports with a mix of traffic. Recommended approach speeds are very low (52 knots), which would give your typical Westchester County controller fits. But it can be flown at an indicated 100 knots right to the threshold and slowed easily to proper touchdown speed.

The best recovery technique for bounced, poorly aligned or otherwise botched approaches, at least initially, is to add power and go around. The Husky will bounce mightily and can easily get sideways—not a good way to re-contact the ground. With full power, the airplane leaps back into the air; with just a touch, it still flies.

Otherwise, handling is typical for this class of airplane: It likes lots of rudder input, and it's not overly twitchy. Transitioning pilots are at risk of groundloops until they have

some taildragger experience. Control harmony is fairly good, which is sadly uncommon in this class of airplane. Rudder and aileron forces are linear in relation to airspeed.

Because of the bungee trim system, elevator deflection forces are fairly high, even at low speed. In fact, it trims like a heavy airplane—a little bit at a time and almost always in response to any power or attitude change. Rudder authority is good right down through low-speed flight, and the aileron spades to work to maintain control at low speeds.

For a lightly wing-loaded airplane, the Husky is quite well mannered in cruise. Properly trimmed, it does not require a lot of attention to maintain course. This makes it a better instrument platform than many of its peers and some owners fly Huskies in IMC. However, that's not the Husky's primary mission.

The big virtue of the Husky is that even during slow flight, properly configured, the attitude of the aircraft is flat; it is flying on the wing rather than hanging on the prop. This is a big safety advantage for spotting, patrol and other low-altitude, low-speed operations, since at these speeds the Husky is not flying on the edge of a stall and the airplane very largely takes care of itself so that the pilot can safely look elsewhere. Power-on stall speed is only 33 MPH with flaps.

Tailwheel steering authority on the Husky is good, which makes ground handling simple except in high winds. A touch of differential brake swings the aircraft around briskly. The brakes are powerful: At slow taxi speeds, their over-enthusiastic application will bring the tail off the ground.

Ground handling, by the way, is aided by convenient handles on both the aft fuselage and elevator. These give line personnel little excuse to mishandle the airplane when moving it around on the ramp.

PERFORMANCE

As already mentioned, slow flight is the Husky's strong suit. It was not designed as a cross-country hauler, although owner feedback proves it is capable of going places. That's because the airplane also has a reasonable cruise speed, quite competitive with fixed-gear airplanes of similar power.

Cruising at 55 percent power should yield 113 knots true; at 75

percent, 121 knots. Top speed at sea level is 126 knots. Listed fuel consumption at 55 percent is 7.7 GPH; at 75 percent it is 9.3 GPH. Still-air range at 55 percent is 695 miles. With power set for an airspeed of 96 knots indicated, endurance is an impressive seven hours.

Of course, going slower boosts endurance. Just ask Kris Maynard, an A-1A Husky owner. On March 1, 2008, Maynard took off from Indianapolis, Indiana and flew his Husky along a triangular course of 753 miles, burning only 190 pounds of fuel (30 gallons) in the process and setting an internationally recognized record in a new efficiency category. Then, Maynard flew the Husky 15 hours, three minutes and 20 seconds without refueling, covering more than 1200 statute miles. On this flight, he burned only 3.156 GPH—for 25.26 MPG—and landed with 90 minutes of fuel remaining.

But after a long flight, you still have to land. With some practice, you can operate a Husky from a football field. Factory numbers for ground runs at sea level are: maximum performance takeoff, 150 feet; landing 250 feet. Even in high density altitude conditions (for instance, at 7000 to 8000 feet) and at full gross weight, the Husky's performance is impressive.

And it performs well on floats. Part of this is attributed to close attention to the relative angle of incidence between the floats and the wing. Float-equipped cruise at 5000 feet is a quite respectable 106 knots true.

When loading a Husky, center of gravity is rarely an issue, since the bias is toward the front end of the range with just one aboard due to the relatively large engine and constant-speed prop.

Standard useful load is 610 pounds. A full load of fuel—50 gallons usable, or 300 pounds—leaves 310 pounds of payload available. The baggage compartment behind the rear seat—reached by folding the rear seat back forward—is rated at 50 pounds. An access door is a factory option on new aircraft.

COCKPIT/CABIN COMFORT

Like many of its peers, getting into a Husky is hard to do elegantly. Of course, if you're not willing to mount up properly, you shouldn't be flying an airplane like this. Rather than

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HUSKY HAVOC: LANDING PRANGS

We'll start with the good news that came out of our examination of the 100 most recent Aviat Husky accidents: There were extraordinarily few engine/mechanical accidents and absolutely no accidents that were fuel related. In our accident surveys, we expect to see about 15 engine/mechanical accidents—there were three, and two of those were apparently due to carb ice.

Now the bad news—some 65 wrecks were on landing (10 of those involving floatplanes on water). While we expect 40 to 50 percent of accidents for tailwheel airplanes to involve landing problems, there's something about the Husky that leads pilots to grief at a surprisingly high rate on landing.

We can't help but wonder if landing gear geometry plays a role as 20 landing accidents involved pilots flipping their airplanes over on rollout—a significantly higher rate than we've observed on any other tailwheel machine. One pilot even managed to flip his Husky on takeoff. Almost all of the events involved flipping the airplane inverted, rather than just up on the nose, and most were done with the brakes.

One of the flip-over accidents involved the airplane hitting something (a hole) on the runway. Two flip-over adventures occurred when pilots landed in snow that was deeper than they thought.

We also have to attribute a percentage of the landing accidents to testosterone poisoning. That may draw some pilots to the Husky in the first place. One pilot had set the parking brake so he could make a number of "water ski" passes—touching the main gear to the surface of a lake. You got it—he forgot to release the parking brake.

A number of landing accidents took place in remote areas where the terrain turned out to be less inviting on rollout than it had appeared from the air. Three pilots who landed on roads couldn't keep their airplanes on them—a 12-knot

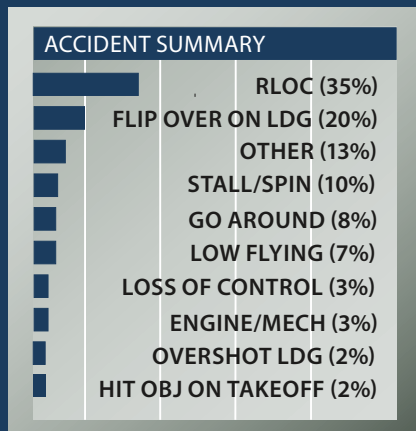
quartering tailwind didn't help at all in one loss of control accident.

There were only seven low flying crashes—we think the low stall speed and power-to-weight ratio of the Husky kept that number from being higher. Nevertheless, pilots were able to demand even more performance from their Huskies than was built in. One pilot regularly did a hammerhead turn shortly after takeoff until the time he didn't have quite enough altitude to recover. Another pilot took his passenger with him across the Styx after buzzing a lake and people on shore for 15 minutes, doing some water skiing and then stalling and spinning into the lake after one of his steep pull ups.

Three pilots crashed, and survived, while practicing flight just above the ground in rugged areas. Two hit downdrafts crossing ridgelines and couldn't recover before impacting terrain and one stalled into the ground while doing turns in a canyon. There are benefits to a low stall speed and good restraint system.

The peril of glassy water was a factor in most of the floatplane accidents. In one, the airplane hit so hard the floats were ripped off.

A pilot trying to shoot a coyote from his Husky said his shotgun jammed. He lost just enough altitude in the subsequent steep, repositioning 360 to hit his own wake turbulence. He hit the ground before he could get another shot off.



sliding in like a car, the pilot and passenger more or less hoist themselves aboard.

For a conventional-gear airplane, forward visibility is very good for pilots of average-to-tall height, despite the large, high wing (shorter pilots can adjust the view by using thicker seat cushions). A skylight in the overhead helps spotting traffic in turns.

Long missions in other light utility aircraft can be fatiguing, both because of the constant need to keep the airplane right side up during low-speed operation, and also because control forces—especially roll control—are high and therefore fatiguing. The Husky ranks favorably in this category, especially after pilots learn to adjust pitch forces by anticipating trim input.

One of the biggest shortcomings of the Husky, at least for tall pilots, is the front seat. It is a fixed part of the structure. All adjustments are made by changing cushions. But after an hour or two, discomfort becomes the most noticeable element of flight, overwhelming the good performance, fine visibility and relatively low control effort.

Visibility and comfort is better in the rear seat. The seat is wider, the angle of the back rest is better, and there is more leg room fore and aft. One shortcoming is the lack of heat for the back-seater—not an issue in warmer climates—but certainly one to consider in colder ones. With relatively little soundproofing the noise level is high, but not so much so that owners complain about it. Headsets are, of course, a must.

MAINTENANCE/TYPE CLUBS

The Airworthiness Directive picture for the Husky is a good one. Only two ADs are specific to the airframe, with the remainder targeting either the engine or the prop.

One, 90-20-5, applies to 1988 to 1990 models and calls for inspection of welds on the seat back and addition of reinforcements if needed. The other AD, 91-23-2, applies only to 1988 models and calls for the replacement of the carburetor air box.

There haven't been too many squawks on the airplane, but it would be a good idea to check the stainless steel control cables for wear and look for any vibration-related problems in the baffles and cowling that might be

related to the relatively rigid engine mounting.

We're not aware of a formal type club covering the Husky. There is www.flyhusky.com, an information-sharing site and forum useful for finding Husky owner gatherings, maintenance topics, flying tips and the usual general discussions.

For its mission, it's hard to find fault with the Husky. It does its thing remarkably well, and owners are very happy with it and with the manufacturer. If you're in the market for a working airplane, the Husky is definitely worth a look, and there are plenty to choose from.

OWNER COMMENTS

Once I earned my tailwheel endorsement a few years ago, I knew it was time to ditch the maintenance-intensive complex model I'd been flying in a partnership. My goal was to fly something new, reliably simple, and incredibly fun. My 2006 A-1B has done well on all counts.

The Husky fits a well-rounded mission profile, as it supports everything from a casual weekend lunch run to cross-country travel to advanced training. My A-1B is Garmin GNS530W-equipped, so I can keep instrument current. It will fly low and slow in the backcountry and land on most unimproved strips with its 26-inch Goodyear tires. I travel at a respectable 110 MPH with over five hours of fuel endurance.

When flying around home base, I just enjoy working on tailwheel proficiency with a local flight instructor. There's always a good reason to go flying in this plane.

The Husky appeals to me as a single-pilot owner because it's newer, simple and maintainable. There just aren't too many systems to go wrong, and there are surprisingly few service bulletins and ADs to deal with Aviat Aircraft made the choice to keep things simple, sometimes to a fault (like the seat adjustable only by stacking or removing cushions), but it's resulted in a robust, minimum-maintenance design. Owner-assisted annuals have come in around \$800, plus the cost of consumable parts.

There are some caveats of owning a Husky. It's less than graceful to contort my six-foot, four-inch frame in and out of the cabin. The passenger seat isn't much easier to get in

and out of, but comfortable enough once inside. Insurance is expensive because I'm a low-time tailwheel pilot flying a high hull value taildragger. Anything purchased from the Aviat factory is ridiculously expensive.

There are a number of low-time Huskies available on the used market, and I'm not sure why. I know of a few pilots who felt they could never quite master landing the Husky and may have scared themselves with a few runway excursions. I feel that with good training from a qualified tailwheel instructor these are all non-issues. The Husky does demand attentive rudder control, but I don't feel it's any more demanding than the SuperCub I learned in.

Variables across the models and individual aircraft include wing design, panel layout and avionics capability, payload and interior trim. I chose my 2006 model because it has the newer, spade-free wing design. It also has a full instrument panel, electronic engine instrumentation and really pretty wood floors. It's eligible by serial number for a maximum gross weight increase from 2000 to 2200 pounds.

I forget about all of this, though, once I'm caught in the moment of lifting off of a dirt strip in a few hundred feet, climbing strong, with a big smile on my face.

Chris McCrank
via email

We bought a 2003 A1-B model new from Aero Sport in St. Augustine, Florida, in 2004. We were attracted to the Husky for a variety of reasons including; comfort, operating economy, performance, safety, and fit and finish. Nothing else we looked at excelled in all of these areas.

Our Husky is used for business trips; normally within a 500-mile radius where the travel time compares favorably to the total elapsed time using commercial airlines. As a director of the Recreational Aviation Foundation, we also spend time flying throughout the U.S.—primarily to back country destinations—where the Husky was designed to perform.

At 100 hours, there was a cam lobe failure covered by Lycoming's warran-

continued on page 32



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Aviat Husky

(continued from page 31)

ty. The plane now has well over 600 hours total time and has had no other maintenance issues. It takes about 15 hours to perform a thorough annual.

There are just a few aftermarket add-ons that are available. First and foremost is the MT Prop: less weight and improved performance; this mod requires moving from the standard 6.00 tires to a minimum of 8.50 tires. Regarding tires, the Alaskan Bush-wheel 31-inch model is popular.

There are at least three float/amphib manufacturers offering options and two or three companies with skis certified for the Husky. Also, there is a manufacturer that has produced landing gear that is stronger and facilitates easier transition from floats to tires.

As for complaints, I have none. The common one that I hear is that the Husky is hard to land, but in my opinion the Clark Y wing just wants to keep flying. Most pilots new to the Husky have difficulty stabilizing its approach on final at a slow enough speed. Excess airspeed results in lift that in turn results in bounced landings as they try to put it on the ground while it still wants to fly.

New owners should invest in some training from an instructor with lots of Husky experience. The MT prop helps in that the prop has a profile that acts as a speed brake at low pitch.

Factory support seems to be a mixed bag. I get good response when I have a question or need something. Parts prices seem high on some things and low on others, but if you need it, you need it. Aviat of course, is owned by Stu Horn, who is actively involved,

is a pilot and seems to genuinely want to continue improving the product.

Tim Clifford
Via e-mail

I have owned an Aviat Husky A-1A since 1999. I flew it on wheels for about 35 hours awaiting arrival of my straight floats. I now have over 800 hours with the Husky on floats.

I am a recreational VFR pilot with about 1100 hours. I fly locally and often throttle back because I am not anxious to get someplace. Slow is fine with me. I have almost no experience flying other float planes (trained on a Cessna 172 at Kenmore), but it is hard to imagine a better float plane for a recreational pilot who flies solo most of the time and is not in a hurry. The combination of bush plane and light floats (Baumann 2100s) makes a wonderful combination.

For me, at my skill level, the Husky is an ideal airplane. So many things are simple: Full flaps on takeoff and landing. Sight gauges give you a visual understanding of fuel status. It is off the water in about six seconds. It climbs like a homesick angel. The low stall speed means that there is an extra margin of safety. When I train, I have trouble getting it to stall with any kind of a break because it just wants to float down.

The engine is bulletproof: After eight years and hundreds of starts, it has never failed to start the first time. Wonderful visibility on both sides out the cockpit. Huge wings give it remarkable control in ground effect,

FEEDBACK WANTED

MOONEY 231



For the July 2015 issue of *Aviation Consumer*, our Used Aircraft Guide will be on the Mooney 231, the high-flying turbocharged traveler. We want to know what it's like to own these planes, how much they cost to operate, maintain and insure and what they're like to fly. If you'd like your airplane to appear in the magazine, send us any photographs (full-size, high-resolution) you'd like to share to the email below. We welcome information on mods, support organizations or any other comments. Send correspondence on the Mooney by May 1, 2015, to:

Aviation Consumer
e-mail at:
ConsumerEditor@
hotmail.com

plus—I love flying with a stick—compared to a conventional control yoke.

The minor deficiencies have to do with its size, and perhaps its weight. It is a light aircraft. It does not like rough water and I avoid it. It is rather sensitive to gusts and updrafts. When I look at the small support structures for the large elevators, I wonder if they will ever fall off, although to my knowledge it has not been a problem for the Husky.

I would prefer to have my passenger or copilot on my shoulder (rather than a tandem) but then you would give up the visibility out both sides. Getting in and out of the Husky is awkward and not something I will want to do if I ever get arthritis.

All in all, I would choose the same airplane again.

Tim Farris
Bellingham, Washington