

The Aviation Consumer[®]



American Champion

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FIRST WORD

A Tale of Two Engines

After a fashion, our reader surveys are sometimes like collective scab picking. That's certainly the case for this month's reader feedback project on owner experiences with factory rebuilt and overhauled engines. The results proved illuminating, but also highly polarized. In other words, we hear from the outer bands of the spectrum—those pleased and those not so pleased—but not from the broad middle ground of people who are mildly satisfied or maybe just not thrilled.

This round of surveying seemed to yield more bile than any recent surveys and I think there's an explanation for that. Many owners are just hanging on to the notion that their airplanes retain good value. I'm not talking about market value, but personal, perceived value. In other words, is all the money I'm spending on this thing still worth it?

It's not that owners can't afford their airplanes; they can. It's just that so many transactions in the ownership experience go sour in minor and major ways that owners get fed up. A maintenance invoice is a third larger than expected; a paint shop is late and it forgets to paint the door jambs; a factory engine arrives with a DOA alternator and missing paperwork. And on it goes.

These foibles of themselves aren't necessarily deal killers if the business is question applies the personal touch and fixes the problem with a smile. And this is where the factories miss an opportunity to build strong customer loyalty. By word of mouth reputation, customers dealing with factories gird themselves to expect a less-than-exceptional buying experience and the factories too often step right into this trap by providing exactly that. Phone calls don't get returned, the customer gets blamed for operating the engine incorrectly, an accessory fails two weeks after the warranty and the factory offers no help.

Contrast that with how the best field shops work. We bought a factory exchange Lycoming IO-360 for our Mooney M20J some years ago. The factory gave us a credit on a cracked case and the new engine had a new case and crank. I drove out to the factory to pick it up and we were down less than two weeks. The engine was stronger, smoother and drier than the engine it replaced. Overall, it was a terrific customer experience and as far as I know, the engine is still flying, albeit not in the same Mooney.

Five years later, in another Mooney, the Continental TSIO-360 came up for overhaul, which we had Zephyr Engines do. Two years after the warranty expired, it developed a significant oil leak. I flew it up to Zephyr Hills to have the shop take a look at it, fully expecting to pay whatever maintenance bill they presented. I didn't even expect to be met halfway on the bill since the engine was well past the promised warranty.

But as so many top field shops do, Zephyr fixed the leak for no charge. I even insisted on paying something, but the shop declined. And that is the stuff of unshakeable customer loyalty that assures Zephyr will get my next engine, not to mention a lot of positive recommendations. Would I buy another Lycoming factory engine? I definitely would, probably in a circumstance where downtime mattered or a field shop, for whatever reason, couldn't deliver. Price might drive it, but I'm usually not a price-only buyer.

Can the factories match this kind of service? I'm not sure, but in my view, they could do a lot better by adding a personal touch to customer service and warranty claims and giving their service people a little more latitude to work with customers on parts at cost, discounts or other considerations. In my view, most customers don't have unreasonable expectations and are, in fact, easy to satisfy, if not please. But telling the customer he operated his engine incorrectly isn't the way to get there. —Paul Bertorelli



Garmin aera 796

I watched with great interest your video on the aera 796. Good looking piece of tech for the airplane, but I have a question:

Will the unit function as a display-only for charts and plates if for some reason it loses its GPS reception or does it have a display-only function for looking at charts and plates?

Stoney Truett
Via e-mail

The aera 796 doesn't need GPS position to function as

a chart or plate reader. However, with no position, it won't be able to geo-reference aircraft position on the charts and plates. Nor will the 3D Vision or flight panel page function.

I just read your review on the aera 796 and you did cover it well. Being a Garmin fan, I am going to have to say this has very little in the way of it being a iPad killer as other reviews have said, but you guys did not.

- There are many things that the 796 cannot do that you can on the iPad.
- You have to use your finger to write on the scratch pad.
- The flightplan does not show on any charts.
- Jepp charts are at no cost on the iPad if you have the MFD Jepp Chart View.
- You cannot rubber band the flight plan to edit like you can with the 695/696.
- You cannot see the data fields on the map page.

John Jones
Via e-mail

CO Detector Feedback

Your February 2011 issue featured an article on the top-value CO detectors

with the top choice being the BW GasAlert Extreme. Based upon your recommendation, I purchased one to use in the cockpit of my Beechcraft Bonanza.



regulator which retails for about \$205 and recalibrate it myself. This brings the cost to over \$450 to have a functioning detector. If recalibration expense is a factor with all CO detectors, I feel it should be mentioned in the cost.

Harry S. Amster
Via e-mail

IO-390?

I will probably be going through an engine overhaul on my PA-28R-200 in the next two years or so. I have 400 hours left before overhaul.

I am seriously considering replacing my 200-HP IO-360 with the Lycoming 210-HP IO-390. However, I have only seen a short insert in a 2008 article from Aviation Consumer about this engine.

It has been in the experimental market for a few years, and if everything went as planned, should have been certified in 2009 or 2010.

Will *Aviation Consumer* be doing an article on this engine soon? Do you have any information concerning this engine that you can share? Are mechanics up-to-date on the care and feeding of this engine? How is the cost? What kind of value can one

expect for the old engine if purchasing this new one? You get the idea.

It was everything your article claimed, for six months. At that point it needed to be recalibrated. In my case, I either have to ship it to California or some other state for recalibration as no one does it in Arizona or I need to purchase a tank and

expect for the old engine if purchasing this new one? You get the idea.

Maurice Givens,
Des Plaines, Illinois

The IO-390 is a certified engine and available from Lycoming. Our factory engine survey on page 8 of this issue drew reports from three owners of Lycoming IO-390 engines, two in experimental aircraft and one in a Mooney. None of the owners commented one way or the other, nor did they report any particular problems with the engine. We'll take a closer look in a future issue.

Baron Addition

In my report in your Used Aircraft Guide on the Baron (see *Aviation Consumer*, September 2011), I erred in the sentence regarding takeoff distance for the B55 Colemill Baron.

The max gross takeoff distance is just under 3000 feet, not 2000 feet. Short field takeoff with minimum fuel and single pilot is just under 2000 feet.

I apologize for the error and would encourage my fellow Colemill Baron drivers to flight test at various loads and density altitude conditions to determine their own performance stats.

Ron Hays
Santa Barbara, California

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Buying into NextGen: Piecemeal May Be Best

With the deadline nine years out, we wouldn't buy gear now unless part of a repair or upgrade. A passive traffic option or Canadian ruling could change that.

by Jeff Van West

If you have an IFR-certified GPS with WAAS in your panel, you're already equipped to take advantage of the bulk of what NextGen has to offer GA today. There, don't you feel better?

The reason is that NextGen is a fat catch-all for a host of technologies that mostly target airlines and major airport ground ops. Biz jets will reap some of the airline-focused bennies, but for the bulk of GA, NextGen boils down to RNAV instrument approaches and ADS-B. And it will likely remain that way for the next decade at least.

EASY CALL: GO WAAS

Tackling the easy decision first, we think any panel work that includes an IFR GPS installation should be a WAAS unit. You could save some bucks with a used KLN 94 or just repairing your 430 without turning it into a 430W, but you'll be short-changing your IFR capability. This is no trivial gain; LPV approaches (the GPS equivalent to an ILS) outnum-

ber ILSs over two to one. That ratio exceeds four to one if you count all GPS approaches that have vertical guidance of some kind.

The other reason to go WAAS, perhaps even for a VFR-only aircraft, is that WAAS GPS can be the position source for your ADS-B solution. Technically, this doesn't have to be a WAAS GPS, but for GA, it's simpler to just to assume it does. Any new model from a major manufacturer will work in this role, as will a Garmin GNS 430W/530W or GNS 480. Those legacy units will require a software upgrade to be an ADS-B position source, but Garmin has told us that will be offered free of charge.

A similar logic applies if you're looking at a used G1000-equipped aircraft: Get one that's already WAAS equipped, or factor in a conversion cost north of \$10,000. ADS-B software upgrades for these will be through the OEM, so the cost will vary. All Avidyne R9 aircraft are WAAS.

Bill Stone of Garmin told us that virtually all the Garmin WAAS GPS navigators could handle the complex curved paths that make up the fanciest NextGen instrument approaches. It's unlikely GA will see curving paths to a decision altitude soon (or maybe ever) but our navigators have the potential. Stone points out that such an upgrade for a sunseting product like the 430 is unlikely, but a new GTN would be ready if the FAA gave such things a green light.

Complex approaches bring autopilots into the mix because it's possible such approaches would require an autopilot. We only know of two common GA autopilots fully capable of handling the complex RNAV approaches: Avidyne's DFC 90/100 and OEM installs of Garmin's GFC 700 autopilot. An S-Tec 55X or Bendix-King autopilot might be hacked to work, but don't count on it.

We wouldn't go out of our way to ensure we had one of these autopilots today, but future capability should at least factor into the buying decision. Likewise, the announced Avidyne IFD 540 nav/comm uses digital radios. While that means little today, it lays the groundwork for digital clearances and other goodies that might be available before the box becomes obsolete. Garmin's new GTN series uses traditional analog radios. Not a critical factor by any means—it may never matter—but it's still worth factoring in.

ADS-B: 1090ES FOR ALL?

ADS-B purchase planning is a stickier wicket. It helps to clarify the four equipment





Your buying decision may hinge on how much you want this kind of information. This is a prototype of advanced traffic awareness planned for ADS-B. Note the combination of aircraft data, directions and threat status. The "-23" target with no vector is a hovering helicopter. The brown targets at KMHT are on the ground.

components involved. Two are required, two are not. By 2020, all aircraft flying in the bulk of U.S. airspace must have an approved GPS position source and a transmitter that sends that position and additional aircraft data out to air traffic control. Those two items together are ADS-B Out. The transmitter can operate on one of two frequencies, 1090 MHz (the same as a transponder) or 978 MHz.

The other two components are reception of traffic targets around your aircraft, which can be sent to you on 1090 MHz or 978 MHz, and datalink weather, which is only transmitted on 978 MHz. Those two components share the name ADS-B In, even though they are completely separate services.

To make things a bit more complex, the 1090 MHz solutions require

separate boxes. There's a 1090ES transponder to satisfy the broadcast of your position, and a 1090 MHz traffic receiver to show other traffic to you. The 978 MHz solutions usually use an all-in-one box that both transmits and receives your traffic position.

In practice, however, you may have only one choice. All aircraft that fly above 18,000 feet or travel internationally must use 1090 for their ADS-B Out. Canada hasn't officially ruled just yet, but it's likely they'll require 1090. This makes going the UAT route either forbidden or potentially limiting for many aircraft. Who wants to invest up to \$10,000 in a system that prevents you from travelling outside the U.S.? (Hold that thought.)

The cheapest route to ADS-B Out compliance is a \$1200 upgrade to an existing Garmin GTX 330 (or GTX33) to make it a GTX 330ES, and

then connecting that GTX 330ES to an approved GPS position source. For many aircraft, that connection already exists and only needs the aforementioned software upgrade. Congratulations, you're compliant with ADS-B out. G1000 aircraft are almost universally equipped with a blind-mounted version of the GTX 330, so the same upgrade path applies, but costs will be set by the OEMs.

If you don't have a GTX330, you can buy a new GTX330ES or Aviodyne AXP340 transponder for about \$6000. The Aviodyne unit has the benefit of being a slide-in replacement for the Bendix King KT76A/KT78A transponders. However, those transponders didn't have a GPS connection, so if you want ADS-B out, you'll have to factor in that connection—which could eliminate any benefit of a slide-in replacement.

These are both great transponders with a host of features, but it's worth considering as well the Trig Avionics TT31. The TT31 fits the tray for the KT76A and meets the ADS-B out requirement (when connected to a suitable GPS) for \$3254. Trig also has its TT2X series of remote-mounted transponders and control heads. Pricing on these are \$2100-\$2500 and they are real panel space savers. We can't speak to the long-term du-

Free weather can be received equally well from a portable or an installed UAT. Displaying weather on a portable screen can cut costs.



rability of Trig equipment, but we've been impressed with the company's designs so far.

We can see logic in upgrading to one of these systems if you have to spend \$1500-2000 to replace a failing Mode-C transponder anyway. Even under ADS-B, you must maintain a Mode-C transponder. The 1090ES transponders satisfy both that Mode-C requirement and the ADS-B requirement in one stroke, so you're leveraging your repair costs toward the inevitable upgrade.

The other potential reason is to get ADS-B traffic in, but there's a product hole here. Both Garmin and Avidyne have combination systems that employ both active traffic (they directly interrogate other transponders) and receive ADS-B traffic, the GTN 800 series and TAS 600A series respectively. Actually, only the Garmin system currently does both active traffic and ADS-B. The Avidyne system will do both with an upgrade due next year. The Garmin system starts at \$9995. The Avidyne

one starts at \$8490, but the ADS-B upgrade will cost "under \$2000," so we consider the two systems roughly equivalent.

Active traffic is terrific, but expensive. Avidyne and Garmin tell us they are considering passive systems that only use ADS-B data, but can't offer prices or timelines. Trig's TA60 series promises to do exactly this with certification by year's end and prices starting around \$2000. Even factoring in an installation cost of running the traffic data to an existing MFD or handheld GPS, this could make a compelling traffic solution for those who fly in congested areas with good radar coverage.

Why does radar matter? Here comes another part of the ADS-B puzzle. If your aircraft broadcasts a 1090 MHz ADS-B signal that's received by an FAA ground station—whose coverage area should be equivalent to FAA radar by 2013—that ground station will transmit back to you a custom picture of traffic around your location. That traffic

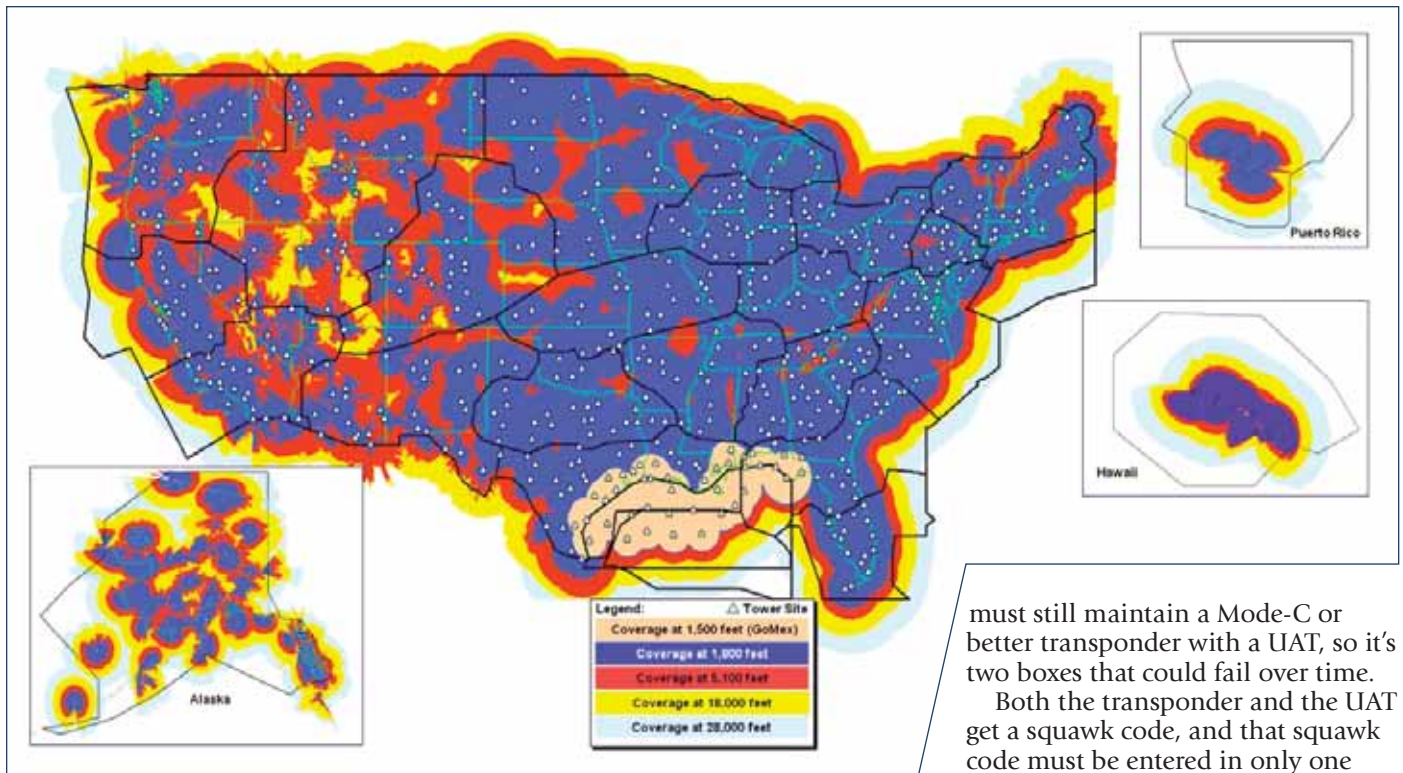
picture includes all ADS-B traffic it sees and all traditional transponder traffic it sees. If you're out of sight from a ground station, you won't get that traffic data. However, you will still see any other traffic broadcasting ADS-B on 1090 directly from their broadcasting transponder.

For an aircraft that flies in areas of good radar coverage, doesn't have a traffic system but has an MFD (or portable) capable of displaying traffic, the one-two combination of a 1090ES transponder and a passive ADS-B in traffic system could make real sense and come in well under \$10,000 installed. But remember, that system will never receive free datalink weather.

UAT FIGHTS BACK?

Even though the 978 MHz UAT is only a realistic option in the U.S. and under 18,000 feet, FreeFlight Systems thinks it's the right choice for many aircraft. Why? Because it's low weight, low power and can be made cheaply. "We're an absolutely

MANUFACTURER	PRICE	ADS-B OUT	TRAFFIC IN	WEATHER IN	COMMENTS
AVIDYNE					
AXP340 TRANSPONDER	\$5995	1090ES	--	--	ADS-B OUT
TAS600-SERIES	\$8490 AND UP	--	TAS/1090ES	--	INTEGRATES ACTIVE AND ADS-B TRAFFIC. ADS-B IN WILL REQUIRE \$2000 UPGRADE
FREEFLIGHT SYSTEMS **					
RANGR TRANSCEIVER W/GPS	\$6995	UAT	UAT	UAT	ADS-B IN AND OUT, FULL UP SYSTEM
RANGR TRANSCEIVER	\$4995	UAT	UAT	UAT	ADS-B IN AND OUT, REQUIRES GPS
RANGR TRANSMITTER W/GPS	\$6295	UAT	--	--	ADS-B OUT W/INTEGRAL GPS
RANGR TRANSMITTER ONLY	\$3795	UAT	--	--	ADS-B OUT ONLY
GARMIN					
GTX330ES	\$6000	1090ES	--	--	UPGRADE EXISTING GTX330 FOR \$1200
GTN 800-SERIES	\$9995 AND UP	--	TAS/1090ES	--	INTEGRATES ACTIVE AND ADS-B TRAFFIC
NAVWORX					
ADS600	\$1495	--	*	UAT	RECEIVER ONLY, ARINC INTERFACE \$200 EXTRA
ADS600-B	\$2495	UAT	UAT	UAT	RECEIVER/TRANSMITTER, ARINC INTERFACE \$200 EXTRA
PADS-600	\$1495	--	*	UAT	PORTABLE FOR EXPERIMENTAL APPLICATIONS, BLUETOOTH
SKY RADAR					
SKYRADAR SYSTEM	\$950	--	*	UAT	USB OR WIFI TO IPAD/IPHONE/WINDOWS
TRIG AVIONICS					
TT31	\$3126	1090ES	--	--	RACK MOUNT TRANSPONDER; KT76A REPLACEABLE
TT21	\$2095	1090ES	--	--	REMOTE TRANSPONDER WITH PANEL-MOUNT CONTROL HEAD
TT22	\$2595	1090ES	--	--	HIGH-PERFORMANCE VERSION OF TT21
TA62	\$1800	--	1090ES	--	ADS-B RECEIVER FOR VFR APPLICATIONS (DUAL ANT. \$2700)
TA63	\$2400	--	1090ES	--	ADS-B RECEIVER FOR IFR APPLICATIONS (DUAL ANT. \$3600)
TA64	\$6300	--	1090ES	--	ADS-B FOR TURBINE AND HIGHER-END APPLICATIONS
* TRAFFIC UNRELIABLE WITHOUT AN ADS-B OUT SIGNAL AND ACCURATE GPS. ** EXPERIMENTAL-ONLY SYSTEMS AVAILABLE FOR ABOUT 40 PERCENT LESS.					



The map above shows the proposed “full” coverage for ADS-B by 2013. As you can see, coverage isn’t guaranteed below 1800 feet for most of the country (although, in practice, we have seen it much lower in places). Below coverage you won’t get weather data, traffic alerts on aircraft using the ADS-B solution you don’t have, or ADS-B-dependant ATC services.

must still maintain a Mode-C or better transponder with a UAT, so it’s two boxes that could fail over time.

Both the transponder and the UAT get a squawk code, and that squawk code must be entered in only one place. Modern transponders have a serial output that can connect to the Ranger UAT, but older transponders will need a detector that FreeFlight is developing. It listens to the transponder squawk and sends that code over to the UAT. It will cost an extra \$269.

low-cost solution,” says Peter Ring, a regional sales manager for FreeFlight. This would be a welcome change in the UAT world, as the only certified one to date is the Garmin GDL 90, which costs \$8000.

FreeFlight hopes to have TSO and STCs to install their Ranger UATs on Cessna 172s and 182s, Piper PA24s and PA28s, and the Augusta 139 helicopter by early next year. The \$4995 system uses an approved GPS for position, but for 6995 you can get one with a GPS built in. This is a welcome option for basic VFR aircraft and modern light sport, as many won’t have the approved GPS position source even though they have upgradable transponders. A UAT might be just the ticket.

Modern LSAs are an interesting conundrum with ADS-B. The FAA has said that approved ADS-B installations will be by STC only, but the STC process doesn’t apply to LSAs (or experimentals, for that matter).

Because the UAT both transmits and receives, these aircraft will be compliant with the ADS-B rule and

get both traffic and free weather data when they are in range of a ground station.

That data must be displayed somewhere, but FreeFlight has some ideas. They will be compatible with the Garmin GMX200 and Chelton displays initially, but will also offer a \$79 Wi-Fi module to display both weather and traffic on an iPad. It’s important to note that the Wi-Fi will supply both the data and the GPS position from the Ranger WAAS GPS. Because the traffic is relative to the aircraft’s own location, an accurate GPS position is essential for traffic awareness. We’d expect display on systems like the Dynon Skyview or G300 would come soon if the LSA equipage caught on.

Any DME or transponder antenna will work for a UAT. You can even diplex both a UAT and a transponder to share one antenna. However, you

PRACTICALITIES

While FreeFlight’s UAT argument has legs, we think the uncertainty of Canadian airspace hobbles it. FreeFlight CEO Tim Taylor even admits that an aircraft flying into Canada regularly shouldn’t invest in a UAT, at least not yet.

The other problem with the UAT is that below radar coverage UAT aircraft can only see other UAT

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800-800-1020

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Owner Survey: Factory Engines

Owners seem generally pleased with factory overhauls and rebuilds, but the lack of the personal touch may make rabid loyalty elusive.

With the two engine factories fighting field overhaul shops for a piece of an ever-shrinking engine pie, it's no surprise that the factories are pushing their rebuilt and overhauled engines.

They find enough buyers for these services such that rebuild work now constitutes a significant revenue stream for both Lycoming and Continental. Anyone shopping for an overhaul usually gives the factory

options at least a cursory look.

So how are they doing? To find out, we asked our readers to tell us about their experiences with both Lycoming and Continental factory engines of various kinds. We heard from 345 readers, almost uniformly divided between Continental and Lycoming, an outcome which closely reflects the marketshare of each manufacturer.

Via our sister publication, www.avweb.com, we asked customers of each company for their overall experiences and impressions in buying factory new, rebuilt or overhauled engines. Cutting to the chase here, customers are generally satisfied with

Continental's rebuilt engines, below, get new camshafts and a high percentage of new parts.



CHECKLIST

-  Owners say factory engines are generally delivered on time and perform well.
-  Although priced higher than field overhauls, factory engines usually have higher new parts content.
-  Owners still complain about premature wear in Continental cylinders
-  Both companies could stand to improve warranty response.

their factory engines, although we heard enough complaints to call the results mixed. We didn't see any hate mail, nor did we receive any paens to the industrial magic at Williamsport and Mobile.

One caveat worth stating is that surveys like this tend to attract the polar extremes, with the rabid fans mixed in with customers who aren't quite as happy. The overwhelming majority of complaints had to do with warranty issues that weren't resolved to the buyer's satisfaction.

PRICE SHOPPING

Our survey turned out to be strongly biased toward owners who fly a lot, which these days, is more than 100 hours a year. Some are commercial operators or owners who use their aircraft for business. The majority bought factory rebuilt engines, which both companies offer. One in five bought new engines at a considerable price premium over rebuilt engines. (See the sidebar on page 11 for an explanation of the difference between rebuilt and overhauled engines.)

The largest percentage of owners—64 percent—told us they bought the factory engine because of a combination of warranty, reputation and quality and percentage of new parts. But in our estimation, the new parts content was the strongest single driver. Scheduling was important, too.

"Since I fly 500 hours a year, I need my plane out of service as little as possible. A factory reman delivered to

the shop ahead of change out works well in terms of limited time out of service," said Lewis Young, the owner of a Piper Seneca for which he bought Continental IO-360 engines.

Worth noting here is that most engine purchases aren't transacted with the factory directly but through dealers and distributors, such as Air Power or engine shops that are also authorized dealers.

Although we're not entirely sure we agree, some owners believe a factory engine adds measurably to aircraft value. "I am an aircraft dealer and stock 15 to 20 airplanes a year. Many are candidates for engine overhaul. I generally find the newer planes will yield a better return on margins if a factory engine (reman or straight overhaul) is used. Planes less complex and older are equipped with engines overhauled by Triad engines in Burlington, North Carolina, who have offered excellent, reliable, on time service," said Bob Sutherland of AirMart Aircraft Holdings.

The chart at right summarizes owners sentiments on various questions we asked. The factories and dealers seem to keep up with delivery expectations. In other words, an ordered engine showed up when it was supposed to, which owners deem important. But things can spin out of control.

"My response to the shipping question was 'late but OK' was not due to Lycoming, but to Yellow Freight, who lost track of the box and then found it after a two-day delay someplace in the upper Midwest," said Cessna owner Linda Chism. The factories seem to maintain enough inventory of popular engines to ship on short notice.

RELIABILITY, PERFORMANCE

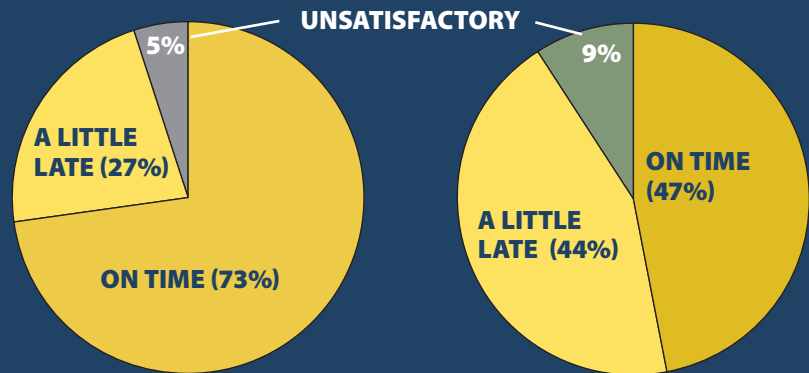
We also asked owners about their impressions of durability and performance of the engines they bought. Here, the two companies ran neck-and-neck, with almost identical excellent to satisfactory percentages, but also a significant percentage—20 percent—who were not happy with their engines for various reasons. Most were pleased.

"Best engine I have ever flown behind. I have had over 25 overhauls in various airplanes. This was the best," one reader of a Cessna 180 with a Continental rebuilt O-470 told us. Although we can't confirm the pattern, high-use owners seem to tilt more in

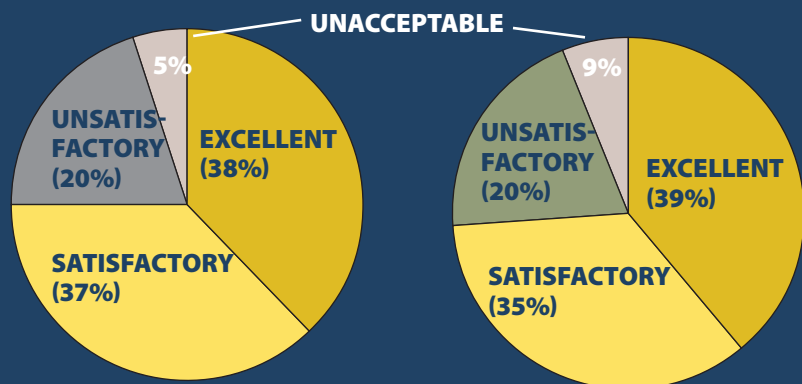
CONTINENTAL MOTORS

LYCOMING ENGINES

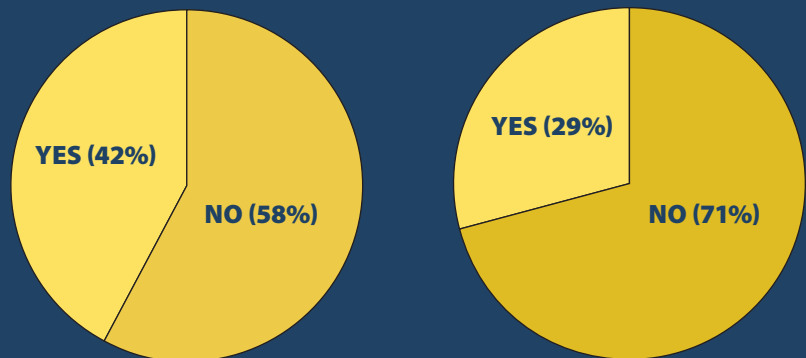
Did the factory meet its commitment to deliver the engine on time?



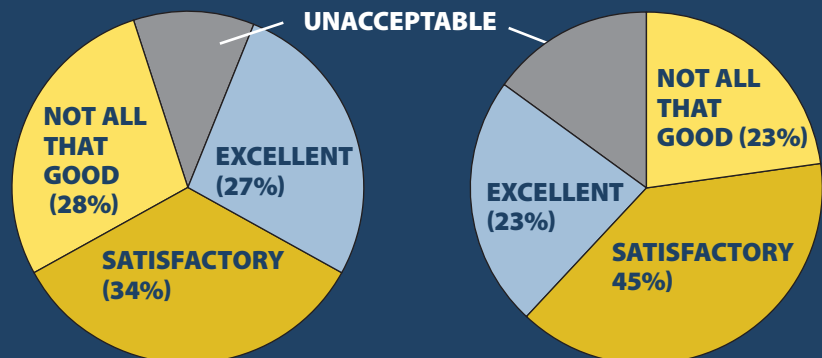
How would you rate the quality and performance of the engine?



Did your engine require a warranty claim?



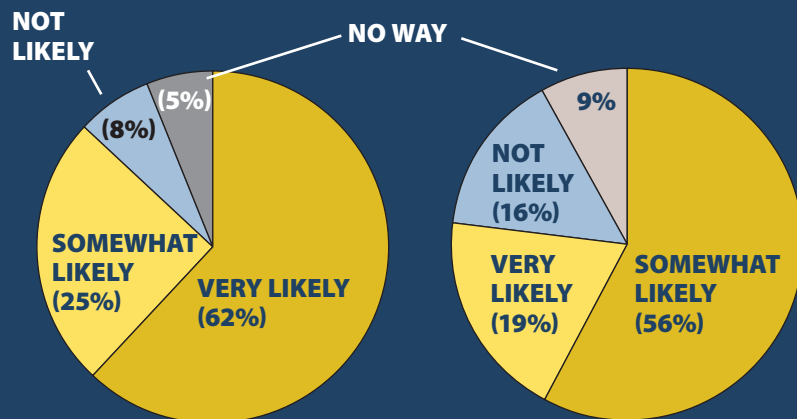
How would you rate the factory response on your warranty claim.



CONTINENTAL MOTORS

LYCOMING ENGINES

How like are you to buy another factory engine or overhaul?



favor of factory engines. "We have a fleet of seven PA-31 Chieftains that put in over 14,500 hours of flight time per year at 80 percent power settings. In my seven years of flying for this company, we have not had a single major engine problem. Lycoming is the best," wrote one respondent.

And some owners went with factory

engines even though they had doubts about doing so. "I have read horror stories regarding TCM. I have no idea as to the truth of the matter. All I can say is that the factory built mine right. It has been smooth in operation with very few, minor squawks, has taken me past TBO and continues to motor on," said John Voninski, owner of an O-470-powered Cessna 182.

But with the kudos came some brickbats. Owners persistently complained about accessories—magnetos, alternators, starters and Continental's troublesome starter

Lycoming offers three options: factory new, factory zero-time rebuilt and factory overhaul.



adapter. We also heard complaints about Continental's cylinders losing compression prematurely.

"The rotating mass didn't have any trouble, it was the carb and the mags that gave out in less than 100 hours," said one owner of a Cessna 172. "The mag was a simple pull and exchange, but the carb was a nightmare. The factory spent 20-plus hours with our shop between the adjustments and pulling and shipping back, then getting it back with the same problems. Finally, our mechanic got them to send a different carb. Worked great. Just lost a month of flying."

"My Lyc factory new IO-360 was shipped with a faulty alternator that had intermittent failures in the first 10 or 20 hours of operation. A new alternator was provided under warranty with an couple hours of labor credit for my A&P to make the change," said George Schandel. Eight hundred hours later, he got caught in one of Lycoming's crankshaft ADs.

Our impression from reader mail is that complaints about premature failure of Continental cylinders had abated. Yet our survey still revealed some problems. "Engine was great at installation. Very smooth, perfect in fact. Now, with only 700 hours, getting some problems with low compression. Pulled one cylinder and could not re-install it as it had a ring-step and the cylinder shop red-tagged it. I went 2000 hours on my last engine, which was a factory reman. I am hearing and believing that the cylinders just are not as well made as they used to be," said Brian Conway, owner of V35 Bonanza.owner.

WARRANTY BUGABOOS

If there's any area where the factories consistently raise the ire of their customers, it's in warranty, both the warranty itself and its administration. We could fill a page with complaints.

"Warranty is worthless unless you fly a lot of hours every year, as in a commercial operation," said a Cessna 185 owner with a Continental engine. "Cylinders all needed repair well before mid-time. Discouraging. Talking with factory reps, they just focused on how I operated the engine. I have a six-probe probe EGT and CHT and I've been flying 35-plus years and know how to run the engine. I have heard that Continental has improved their cylinders in recent years, but have not

seen data, only anecdotal references.”

Added William G. Miller: “I really fretted about using Continental when I had to have my engine overhauled, but I had to comply with the AD on the crankshaft. TCM provided the shaft at no charge. I talked to TCM and they swore that all the problems with their cylinders were in the past. So I paid my \$25,000. Two hundred hours later, the first two cylinders had compressions of 25 PSI. Leaking through the exhaust valve. Continental just said it was my fault. I didn’t fly the engine properly.”

Many warranty complaints relate to the factories or dealers just saying no on the simplest requests, or appearing to drag their feet on resolving customer complaints. “The customer service folks at the factory have the tools to help the customer, but in my experience, they did not use the tools,” said the owner of a Lycoming-powered Mooney.

“Went with factory reman only to get roller tappets. Engine had oil leaks and oil temperature problems from day one. Four vernatherm valves later, the oil temp problem was resolved. Lycoming sent a factory tech to replace my defective accessory case to fix the oil leaks. I wanted a replacement engine based on a lemon law ruling, but they would not do that. Engine still leaks oil and has stuck an exhaust valve twice in 900 hours,” said Monte King, a Cessna 177RG owner.

On the other hand, it’s not all doom and gloom on the warranty front. “I had a really great experience with Lycoming and would never purchase anything but a factory new or reman in the future,” said owner Claude von Plato. “The west coast technical representative, Brian Costello, is a first class act with a wealth of knowledge. I’m happy that Lycoming values employees such as he.”

WHAT TO DO

Despite what we could call warranty administration that could clearly be improved, we wouldn’t recommend against factory overhauls on that basis alone. We heard enough positive reports to say that factory engines offer value for the investment.

They’re an excellent choice for high-use operators who need an exchange engine and can’t afford the downtime

continued on page 32

FACTORY ENGINES: WHAT YOU GET

With competition fierce and the economy flat, there’s some price pushback in the market for new and rebuilt engines. Of the two factories, Lycoming’s prices have increased more than Continental’s since our last price sweep in 2007.

All of the factory options offer engines that contain more new parts than a field overhaul might. We say “might” because the field overhaul may need as many new parts as the factory provides, but you won’t know until the shop breaks inspects your core.

The factory options include new cylinders, but field overhauls usually offer a choice between new factory cylinders, new third-party cylinders from ECI or Superior, or overhauled cylinders. That means a field overhaul estimate will have more price flexibility than a factory invoice will.

Factory engines get new cams, while field overhauls may or may not, depending on the condition of the old one. You can spec a new one, but you’ll pay an upcharge. Factory new engines have new everything, including the crankshaft, while Continental’s rebuilt engines may or may not have a new crankshaft. The same applies to Lycoming overhauls. If the engine core you sent for overhaul has a good crank, you’ll get it back. When you buy a rebuild, unless it’s a custom rebuild, you’re not getting your core back, but swapping it for a rebuilt, zero-timed engine that may or may not have a new crank. You can ask at the time of purchase, if you think it’s important.

Continental offers only new and factory rebuilt engines; no overhauls. But a rebuilt engine isn’t the same as an overhaul. It’s manufactured entirely to new limits and gets a zero-time logbook. Ly-

coming offers new, zero-time rebuilt and overhauled engines. Think of Lycoming’s overhauls as just a field shop inside the factory, but one with access to new parts that inevitably find their way onto the engine.

The biggest difference between a Lycoming overhaul and a field overhaul is that there’s only one choice on cylinders: new Lycoming cylinders. Otherwise, although it has the new parts specified in Lycoming’s overhaul manuals, it may or may not have more new parts than a field overhaul, but it probably will.

The factories offer limited boutique services such as flow matching and balancing, but no STCs and accessory choices, while overhaul shops are more flexible. You can pick and choose what you want from these upgrades, such as ECli Nickle+Carbide cylinder treatment.

Neither Continental nor Lycoming offer warranty based on hours. Continental’s is 18 months flat or TBO, whichever comes first, with 12 months on accessories. Lycoming offers a flat 24 months, which is a good deal for high-use operators who will reach TBO before the calendar time expires.

ENGINE COST COMPARISON			
The Aviation Consumer	FACTORY DEALER PRICE*		
	NEW	REBUILT	OVERHAUL**
SELECT LYCOMING ENGINES			
O-320-D2A	\$42,848	\$28,791	\$25,133
IO-360-L2A	\$49,847	\$34,248	\$30,589
O-540-E4B5	\$56,293	\$37,933	\$33,665
IO-540-K1G5	\$68,956	\$49,069	\$44,801
TIO-540-AH1A	\$105,636	\$80,583	\$74,485
SELECT CONTINENTAL ENGINES			
IO-360-KB4B	\$38,646	\$32,255	\$29,136
O-470-R25B	\$31,036	\$26,525	\$23,536
TSIO-360-MB2B	\$59,814	\$47,530	\$43,557
IO-520-BB3B	\$38,204	\$31,379	\$28,308
IO-550-B3F	\$39,941	\$35,246	\$31,959

*Where applicable, prices assume an acceptable core, otherwise, additional charges may apply.
 **Continental doesn’t offer a factory overhaul. Prices given here are Mattituck field overhauls with new cylinders.



American Champion: State of the Art Classics

The Champion line traces its roots to 1940s rag-and-tube construction and although they're still made that way, although the tools and methods have changed.

by Paul, Bertorelli

For as bad as the aviation boom-bust cycle is for companies that make airplanes, it's just as bad for the people who buy them. The euphoria that goes with pocketing the keys to a brand new airplane has to be tempered by the reality that the company that built it maybe teetering toward bankruptcy.

Is there a better business plan, one that envisions modest production and flexible size and that can survive the test of the worst economic downturns? There are at least

a couple of examples that suggest this can work. The family-owned Maule Air is one, shipping 30 or 40 airplanes a year to Cessna's 500, but lately a lot less. American Champion, which counts as the most enduring rag-and-tube manufacturer, is another, building as many as 90 airplanes a year but as few as a third of that number.

And despite the worst downturn in 30 years, American Champion keeps the lights on, producing what are essentially modernized,

improved versions of airplanes that trace their roots back to the Aeronca Champ, a contemporary of the famed Piper Cub. Although these designs may seem like throwbacks, they hold down a niche in a weak market dominated by newer metal designs from Cessna and composites from Cirrus and Diamond. To slide into a cockpit of a Champion Aircraft, with some glass in the panel, is not so different from being in a Cessna or a Diamond.

How does Champion do it? With intense vertical integration, careful cost control, realistic marketing expectations and, as we learned on a recent visit, sheer determination to stay in the business.

LONG HISTORY

What is now American Champion, which calls a former farm in Rochester, Wisconsin, its home, dates to the late 1920s, when the first C-model Aeronca appeared. The company really took off after World War II when the popular 7AC Champion rolled out, eventually finding more than 7000 buyers.

The inevitable downturns, the first in 1954, halted production and the company went through various owners. In 1954, Robert Brown acquired the original Aeronca and renamed it Champion Aircraft Corp. It began production of the 7EC. New models came out of that period, including the Citabria aerobatic airplanes and even a twin called the Lancer.

In 1969, Champion was again sold, this time to Bellanca, which developed the Decathlon, but suffered a factory fire and the sold the assets again. By the early 1980s, the company reestablished in Tomball, Texas, but that operation went south, too. By the end of that decade, although aircraft sales were still anemic, the current company owner, Jerry Mehlhaff Sr. sensed an opportunity. Mehlhaff had been a Piper and Mooney dealer sold Bellanca for awhile.

He knew aircraft sales and thought he could make a business of building and selling improved ragwing taildraggers. He bought the company, lock, stock and 16-trailer loads of jigs, tools, materials and type certificates. In 1988, he moved the operation to a farm in Rochester, Wisconsin, 20 miles southwest of Milwaukee.

MODERN CHAMPION

Today, American Champion still occupies the same farm, now equipped with its own paved runway. Production is housed in four sprawling metal buildings with a small office and engineering complex nearby, totaling 75,000 square feet.

For a small company, American Champion has an almost bewildering array of models and options. In all, there are eight basic models, only two of which share the same engine. When we visited the company in August of 2011, it was just shipping a new model, the Denali Scout, equipped with Lycoming's new 210-HP IO-390.

At the opposite end of the spectrum is one of the original airplanes, the O-200-D powered 7EC Champ which, at 1320 pounds gross, qualifies as the only FAA-certified LSA still in production.

But the meat of American Champion Sales has been in the higher-priced models. The top seller has been the 8KCAB Decathlon, which



Champion fuselages and wings, top, await priming and paint after coming from the covering shop. Although Champion uses traditional welded fuselage frames, TIG rather than gas welding is employed. One major efficiency is a large CAD laser cutter, lower photo, which is used for making ribs from sheet stock and, with a related machine, cutting tube ends. The parts are both more precise and easier to fit and yield from sheet stock is higher.

OPPOSITE PAGE: Wings are built up not in jigs but on saw-horses. Spars and internal tensioning bring them into alignment.





Wings are covered with modern Poly-Fiber, left. Fabric is riveted to ribs. The fuselages still contain wood, used for stringers and bulkheads to hold the fabric shape.



finds a niche with flightschools and colleges that want an aerobatic trainer and with individual owners who aren't ready for a Pitts or an Extra. With an AEIO-360, the Decathlon's base price is \$163,000. The Citabria Explorer (\$134,900) and the Adventure, at \$130,900, have also been strong sellers.

What's most noticeable about those prices is that they overlap generously with the top tier LSA

aircraft, despite being FAA certified. How does American Champion manage?

MARKET PHILOSOPHY

Cost control, efficiency and matching production to market realities, says Jerry Mehlhaff, who is no stranger to survival in a down market. "I rode it out with Piper for almost eight years," he told us. "There were dealers signed up for airplanes they were never going to give away." When he established American Champion, Mehlhaff determined never to get stuck behind a glut of inventory.

ACA sells mostly through its five dealers, but does a little factory direct selling. But it doesn't have a lot of money tied up in completed, unsold airplanes. When a major show such as AirVenture or Sun 'n Fun requires display airplanes, ACA supports the dealers doing the selling with their own airplanes.

It doesn't do much high-profile advertising, says Mehlhaff, because the return just isn't there. "We don't spend a lot of money on advertising because we don't have it. Our dealers

do some fractional advertising," he says. Mehlhaff hoped to inch production up to 100 or more airplanes and although sales had been trending in that direction, 2008 changed that. ACA built 94 airplanes in 2007, but only 29 in 2009.

He estimates 2011 production will be in the 30s to possibly 40 or so. It has downsized accordingly, shrinking from 90 employees down to about 40, who now work a four-day work week.

BUILD IT ALL

During our factory tour, Mehlhaff showed us the company's production philosophy in action and that's basically to build everything in house. And we do mean everything. Mehlhaff showed us a large wall panel to which were affixed dozens of parts, everything from bellcranks, to pulleys to brackets, all made in-house.

We saw one machining center making gascolator caps, something other manufacturers would subcontract or buy on the open market. Even in Wisconsin, which is thick with automotive vendors, Mehlhaff says ACA gets better quality control and economics doing it all in-house.

The largest exception to this might be fuselage frames. These are cut, jigged and welded by ACA, but sent out to an outside vendor for powder coating, a better corrosion preventative than painting.

Modern methods are applied at every turn. ACA uses laser cutters to chop the frame tubing and MIG welding rather than gas to assemble them. (Other manufacturers do the same.) It also made a major investment in laser cutting for ribs and other parts, decreasing cost and improving repeatability.

Part of ACA's bread and butter comes from supporting some 14,000 airframes in the field. It can provide parts for every airplane from the 7ECA forward. It also does major and minor repairs, including replacement of old wood spars with new, metal-spar wings.

The day we visited, a hail-damaged Scout had just arrived for a re-cover. Mehlhaff knew all the details of that job because he made the deal with the owner himself, which is probably something the CEO of Cessna or Cirrus can't say.

AC TV

For a video report on the Aviation Consumer's factory tour and our flight trial of the

Denali

Scout, scan the tag below with a mobile app or use this direct URL to see the video: <http://snipurl.com/x1coa>



ACA'S HOT ROD: THE DENALI SCOUT

The original 7AC Champ had a 65-HP Continental that no one would confuse with being overpowered. More than six decades later, the airframe isn't all that different, but American Champion has stuffed a 210-HP Lycoming IO-390 swinging an 80-inch MT two-blade prop into the airplane and trust us, underpowered doesn't come remotely to mind.

With the IO-390, the 8GCBC Scout becomes the Denali Scout and also ACA's stake to the hot rod airplane market. When Jerry Mehlhaff gave us a demo ride in the airplane, he bubbled with delight at the Scout's performance and his enthusiasm is not even slightly misplaced.

The thing bolts off the runway with such vigor that by the time you think about whether to raise the tail, it's already flying. The 180-HP Scout has a 417-foot takeoff roll and the Denali nibbles 35 percent off that and we believe the claim.

It then accelerates into a 1200 FPM climb, with good visibility over the nose. Speaking of which, the Champion Aircraft have excellent ground handling and good vis over the nose on the ground means you don't have to do S-turns. Good brakes make turns on one wheel easy and precise.

The seats are high and wide for both pilots and a large baggage area to the rear of the backseat will carry 100 pounds. Gross on the airplane is 2150 pounds with a useful load of about 730 pounds. The airplane carries an unusually large volume of fuel, up to 70 gallons usable, so its range is a rather un-taildraggerish 1000 miles or so. (Smaller 35-gallon tanks are also available.)

Ergonomics take some getting used to. A Cub driver will naturally reach for the lever on the sidewall to advance the throttle and sit there while nothing happens. That's the trim control. The throttle and prop controls stick out stalk-like from the left side of the panel. The angles aren't ideal and if we had a choice, we would lower these or perhaps place



the throttle on the sidewall.

The electricals—breakers and switches and jacks for the headsets—live on a panel box at the wing root above the pilot's left shoulder.

As would be expected, performance with a 210-HP engine and a 2150-pound airplane is excellent—far better than the vast majority of taildraggers out there, especially the 150-HP Super Cubs reviewed on page 24 of this issue. At 73 percent power at 3500 feet, we saw 122 MPH indicated, for a true of about 130 MPH, burning about 10.5 GPH. Even at that guzzle, the Denali still has six hours of endurance with generous reserves.

At a more miserly 60 percent power (8.5 GPH), the Denali was doing nearly 120 MPH indicated.

For the stock Scout, landing distance is given as 887 feet over a 50-foot obstacle and we suspect the Denali is similar, but we wouldn't be surprised if a determined pilot could better that considerably.

Touching down on grass, the

ACA's Denali, above, adds a 210-HP Lycoming IO-390 with a Dyna-Focal mount to a standard Scout. Panel can include Aspen glass and Garmin portable GPS, among other options. New tail is a symmetrical airfoil, improving aft CG and slow speed handling.



airplane plants nicely in either three-point or wheel stance and firm braking brings it to a quick stop. Just not too firm...the brakes are strong enough to nose the airplane over.

Mehlhaff sees the market for the Denali as game management and natural resources agencies and back country flying operators. (ACA has sold quite a few Scouts in Australia.) Based on our impression of its performance, it ought to be well suited for these niches. Base price on the Denali is \$182,900, but with options most customers select, the invoice will closer to \$200,000-plus.



Adding Synthetic Vision: Worthy Upgrades For All

Garmin's SVT wins for viewing ease and simplicity, but Aspen's now-certified ESV offers the cheapest buy-in. Avidyne may challenge both in the near future.

By Larry Anglisano

Touchscreen may be the top buzzword in avionics, but synthetic vision (SV) is right behind. Many pilots don't know why they want synthetic vision, or even fully understand exactly what it is, yet the gee-whiz factor alone has made SV systems the most sought after upgrade we've seen in a while.

Whether synthetic vision is worth the non-trivial expense depends on your mission and your ability to absorb a lot of overlapping data on small screen.

ASPEN ESV

Late to market with what they call Evolution Synthetic Vision, Aspen's SV is now certified and flying. It's an option on new Pro-series PFDs (it won't play on entry-level Pilot models) and all MFDs, and is a field add-on for existing systems. The cost for upgrade or new installs is \$2995 per aircraft and requires the installation of a remote aural alerter, if not

already equipped. This puts many upgrades in the \$3500 range.

SV is pilot selectable and when it's turned on in an added menu structure of new operating software, it replaces the traditional blue-over-brown background of the attitude indicator with a real-time, software-generated, 3D view of terrain, obstacles, and traffic (if traffic awareness equipment is installed). It can be configured for full screen, presenting SV on the entire PFD, or split screen. On MFDs, SV can be displayed in thumbnail view or full screen.

Aspen's SV uses what they call a nine-arc-second and three-arc-second resolution terrain data to render the synthetic picture. Three-arc-second provides 400 data points per square mile. That's one data point per second if you're cruising at 150 knots.

The user selects either a narrow or wide field of view, or NFOV/WFOV as it's labeled on the soft keys. Logically, a wide field of view is suited for

Here's the top half of the Aspen display at approximately real size. The forward-looking view adds huge awareness, but the moving picture behind your primary flight display can distract from the flight data.

en route cruising, while narrow field of view tightens it up for approach ops. The SV terrain is presented in topographic terrain color (coloring that is similar to a sectional chart). Terrain alerting shades that base map red for terrain less than 100 feet below and yellow for terrain clearance that's less than 500 feet. The Terrain Warning System (TWS) provides visual, audio (why you need the aural alerter) and text warnings. We wish Aspen could send an audio signal to the audio panel instead of the old-school sonalert. It's just primitive.

Synthetic vision systems use a Zero Pitch Line, or ZPL, as an integral part of their attitude display. You can think of the ZPL as the SV equivalent to the white line separating the orange "earth" from the blue "sky" on a traditional attitude indicator. Aspen's SV shows the ZPL as a single, but split, white line. Terrain poking above the ZPL is above the aircraft's altitude. SV presents all obstacles taller than 200 feet AGL that are within 2500 feet vertically of the aircraft altitude, and they grow larger as they get closer to the aircraft. There's also an Aircraft Reference Symbol, a yellow marker used to determine the pitch attitude of the aircraft relative to the ZPL and pitch scale. We particularly liked this feature when showing the SV on the MFD screen.

As with all SV systems, there's a Flight Path Marker (FPM) that graphically depicts the lateral GPS track and vertical speed of the aircraft to create a three-dimensional pointer of where the aircraft is going. Put the FPM on the ZPL and you are holding perfect altitude. Fly a perfect ILS and the FPM will bullseye the 1000-foot marker on the virtual runway—and you'll do the same for the real one.

The FPM's shape and color change providing an immediate visual cue whenever an alert is generated. It can appear green, white, amber and red. Since the FPM uses VSI data and GPS track, we noticed an inherent lag in its movement, especially with rapid



Aspen's syn vis can be full screen on the PFD (left), split-screen on the PFD (center) or show on the MFD (right).

heading or pitch changes. You have the option of removing the FPM from the screen, but we think it's an integral part of flying SV.

One feature we grew to like is the airport flags. They pop up at 20 miles out, showing the airport's identifier and its virtual location. The flag for the destination that's in the active flight is magenta, keeping in tradition with a magenta course line. The flags disappear at two miles to reduce clutter.

Aspen included unusual attitude recognition in the software, which uses attention-getting red chevrons that point toward the horizon when in extreme pitch attitudes (± 15 degrees in pitch). You'll still see blue and brown on the display so you know which way is up, or down. Garmin offers similar unusual attitude recognition on their PFD.

GARMIN SVT

Garmin's SV is called synthetic vision technology (SVT) and is standard on the G600 and a \$4995 enablement option for the G500 retrofit PFD/MFD. Garmin's SV has a size

The Garmin G500/600 only shows synvis full screen and on the PFD, but there's more space to spread out the data. This is smaller than actual, but the relative size between this G500 display and the reduced Aspens above is correct.

advantage over Aspen's ESV given the bigger screen that spreads it all out. Garmin SV won't play on the MFD. However, a PFD field of view can be represented on the MFD's navigation map as a top-down image that corresponds with the view shown on the PFD.

Garmin SV depicts topography using both audible and visual alerting (terrain that poses a threat to the aircraft is shaded yellow or red). SV data is derived from the aircraft attitude, heading, a 3D GPS fix and a database of terrain, obstacles and other topo features.

Garmin's projected FPM is referred to as a velocity vector, and appears

on the PFD at ground speeds above 30 knots. Garmin's ZPL is drawn completely across the display. An old-school ATP put an interesting spin on flying with the flight path marker for the first time: "I like my steam gauges better than glass, but while cruising along at night in IMC it occurred to me that if I had to ditch in the big lake surrounded the hilly terrain below me, I would have put the flight path marker exactly where I wanted to splash, and that's where I would go. It's that accurate."

We like Garmin's horizon heading, which shows the heading in 30-degree increments on the ZPL. Airport signs appear on the display when the aircraft is approximately 15 miles from an airport and disappear at approximately 4.5 miles. Airport signs are shown without the identifier until the aircraft is approximately nine miles from the airport to reduce clutter.

Garmin's SV runway shows in green for soft-surface runways, such as turf, and gray for pavement. A runway that is associated with an approach in the loaded flight plan





Avidyne's PFD4000 excels in terrain presentation.

real potential for increased safety and peace of mind given intuitive forward view of SV. That's undeniable. Our qualifications are two-fold. First is that intense level of displayed information can be a source of data overload. That's why we give Garmin SVT high marks for simplicity and Aspen kudos for SV on the MFD. Secondly, even though SV is basically intuitive, you'll have to put in some effort and learn how those ZPLs and FPMs really work to reap the full benefit of your investment.

Don't think you can get the same benefit with a portable display like Garmin's new 796, either. Installed SV and portable SV are so different in accuracy, reliability and practical use that they should really have different names.

If you're still planning your glass-panel upgrade, is one company's SV so much better than another that it should sway your buying choice? Not really, but consider this hardware limitation: While a single-screen Aspen PFD remains a solid value, especially for lesser aircraft, you'll need to accept that SV plays only on the PFD. Add an MFD to that Aspen PFD and you should also get a quote for a Garmin G500, as the budgets are getting similar. We think other factors about the G500/600 versus a two- or three-screen Aspen are more important than SV. If adding SV to a single-screen Aspen system, remember you have an additional terrain and obstacle database to keep up.

We also think Avidyne is the company to watch with their in-development PFD4000 retrofit. Its synthetic vision and other features could change this whole playing field. We hope to know more in the coming year.

gets an extra outline in white—a nice touch.

Terrain warning on Garmin's SV seems the most simplistic, if not stark in comparison to other SV systems. Towers and ground obstacles appear as unmistakable 2D symbols, but in perspective view with relative height above terrain and distance from the aircraft. They won't change colors until a terrain alert turns the conflicting feature red and an obstacle label appears on screen.

Speaking of conflict, Garmin's SV traffic is displayed in 3D, appearing larger as the threat grows closer, as well as the traditional white turning to yellow. Get close enough to another aircraft, and you'll see a startling, big yellow orb.

AVIDYNE'S NEW VIEW

Avidyne has yet to certify SV, but their recently announced PFD4000 retrofit and their R9-3 integrated cockpit (launched in the Piper Meridian) will both play it. Don't wait for SV for legacy Entegra displays—it will never happen. We'll look at the PFD4000 and R9.3 in a future article, but here's a primer.

Avidyne has its own nomenclature, but their FPM and ZPL function similarly to Aspen and Garmin. For airport flags, Aspen uses a METAR-style gray flag when the airport is in field of view. The flag is removed at three miles when the runway outlines are clearly visible. With valid METAR data, the airfield flag is

color-coded to represent the ceiling and visibility. And when close for landing, the magenta-tinted runway is depicted with numerical identification and centerline markings.

Avidyne's synthetic vision offers 3D traffic, terrain and obstacles in a logical and easy-to-interpret layout. But then the eight- and 10-inch screens of the PFD4000 and R9 give them lots of of real estate to work with. Terrain is where the Avidyne SV really shines. It's intense and puts a serious emphasis on both awareness and alerting. If you smack terrain flying this system, there's no hope for your piloting skills. A 3D depiction of obstacles is shown out to 12 miles.

CHELTON FLITELOGIC

This little-known system has had SV for years and is loved by its owners but we think it's similar to the Garmin GNS 480/CNX 80—way ahead of its time, but that time has passed.

Chelton never responded to our queries about their plans. We wouldn't avoid an aircraft that had a FliteLogic already, but we can't recommend installing one.

CONCLUSION

The final question is, of course, "Is an upgrade to SV worth the cost?" We'll give that a qualified "yes."

For instrument and night flight, there's a

CONTACTS

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888-992-7736

Cobham Aerospace/Chelton
www.cobham.com

Avidyne Corporation
www.avidyne.com
781-402-7400

Garmin
www.garmin.com
800-800-1020

DRE 205e Intercom: Big Value in a Small Box

For intercomless cockpits, DRE's 205e offers the features and performance of a panel mount in a box small enough to toss in your flight bag.

by Larry Anglisano

The way we see it, any cockpit with more than one seat has to have an intercom. Yet some stark LSAs, ultralights, gliders and pre-electric-system classics go without. Given our ho-hum experience with portable intercoms in the past, the performance of DRE's new 205e stereo portable was a welcome surprise.

PANEL-MOUNT WANNABE

The stereo 205e started life as the DRE 201. DRE built on that model such that the new 205e is perhaps the most well-equipped portable on the market. In fact, its feature list rivals integrated audio panels.

The 205e is a two-place model (reinforcing LSA applications) with dedicated volume and squelch, plus pilot isolation. The two simple knobs for volume and squelch feel sturdy, and the anodized aluminum chassis is rugged without being too heavy.

Finding a place to stash the boxy unit (4.5 in x 2.5 in x 2.5 in) can be a hassle. We tried the map pocket, on the floor and in between the front seats and none worked exceptionally well. Then there's the chore of plugging the unit into the aircraft's audio jacks and hiding the cables. DRE offers an optional rail mount for LSA and ultralight panels, which is clearly the way to go. The unit comes with high-quality, Mil-spec

The box is thick, but it's loaded with controls and optional inputs. There's even another set of jacks on the back to take traffic or altitude alerters.




audio cabling, and the unit either runs on two 9v batteries or with a supplied DC adapter. It has a low-battery annunciator, which is a must for minding the 9v batteries.

DRE claims that weakened batteries won't affect the unit's performance, which isn't the case with other portables we've used. We found battery endurance reasonably good, even when purposely starting with half-used Duracells.

The 205e excels in remote audio inputs. There's a telephone input, music input and recorder output jack, all neatly laid out above the headset jacks on the case. There are also three aux inputs on the side of the unit for engine monitoring alerts, traffic minder alerting, stall warnings or other attention-getters.

We tested the 205e in a Cherokee wearing our Bose ANR headsets switched

CHECKLIST

-  Feature-packed, high-quality design
-  Excellent stereo music input quality
-  Awkward stature benefits from rail mounting.

to stereo mode and were instantly impressed with the audio quality. Microphone audio was on the raspy side, in our opinion. The side tone seemed to overmodulate, and we looked for a modulation gain adjustment that wasn't there.

There is an accurate squelch adjustment. Other portables we've tested have poor squelch controls that tend to clip. Not the 205e. The volume pot worked well, too, offering enough gain in the Cherokee's cabin where a one-quarter-volume setting made for comfy listening behind the Bose ANR circuitry.

But what impressed us the most about the 205e was the music quality. We plugged in our Sony MP3 using the supplied stereo patch cable



CONTACTS

DRE Communications
877-987-9977
www.drecommunications.com

and enjoyed deep, clear tunes for the flight. In fact, the music quality was better than many panel-mount models we've used. There's even a music mute control where you can sing along or have the tunes mute with an open squelch.

There are also smartly designed features that include a stuck-microphone annunciator that's both audible and visual plus a failsafe mode that still allows comm radio functionality if the batteries quit.

CONCLUSION

DRE stands behind the 205e with a three-year warranty and offers a 30-day money-back guarantee. That's impressive for a portable unit with a list price of \$399. (Online prices can be just over \$300.) The Pahrump, Nevada, company also sells headsets and we've heard good things about their customer support.

Based on all the time we spent plugged into the 205e, we proclaim it a solid bargain with high-end performance that impresses.

AC TV



For a video and audio demonstration of the DRE 205e, log on to www.avweb.com and select the video index. Or, to go directly to <http://snipurl.com/c6qs6>.



AIRCRAFT UPGRADES



Seatbelt Upgrades: No Excuse for Bad Belts

If your seat belts are frayed or inadequate—such as a lap belt up front—you can fix it for a reasonable cost. Airbags cost more, but are a real aftermarket option.

by Jeff Van West

The FAA didn't get serious about seatbelts until 1978, and even then it was only requiring shoulder restraints for the front seats. Ten years later, they added the rear. Given how long aircraft stay in service, that means there are thousands of craft flying every day with inadequate protection for the most valuable item on board.

If you're flying with only a lap belt—shame on you. As much as some pilots don't like having belts over their shoulders, the study data has been clear for decades: 88 percent of injuries and 20 percent of fatalities can be eliminated by adding shoulder or additional restraints over lap belts alone, according to the FAA.

HEY, I'VE GOT BELTS

Even if a decent seatbelt system needs to be checked if it's seen over 10 years of regular service. Webbing that's torn or frayed should be

replaced. This includes the threads that stitch the belts together, which shops tell us is often the first thing to go. Loose threads or thread ends hanging out are red flags.

If your belt hardware is good and you're happy with the shoulder restraints, what you need is called rewebbing. This can be done by many FAA repair stations, or you can send the belts out for inspection and rewebbing. Prices vary, but budget about \$40-75 for lap-only belts and \$120-\$150 for three-point belts (belt over one shoulder as you'd find in most cars). The price of a couple tanks of gas to ensure your seatbelts work if you ever need them—easy math, in our view.

The seatbelt hardware can wear, too. Common issues can be detachable shoulder restraints that no longer lock securely into the lap belt, and latches that open under strain. Aircraft that see a lot of short flights, such as trainers, are espe-

In order to withstand the forces of a wreck like the one on the left, the belts must be attached to a serious hardpoint, like the wing spar of this Cessna Cardinal (right). Lack of a spot that strong precludes shoulder belts in some situations.

cially suspect. With worn hardware and webbing, it's often cheaper to buy a replacement for the whole thing. Prices vary widely depending on exactly what hardware and finish you want.

Replacement might be an opportunity to upgrade to an inertia reel, a four-point system (straps over both shoulders) or even an airbag system (see sidebar page 22). Upgrades vary in the time needed, but since some interior disassembly is required, it's often several hours of labor.

There are three ways to upgrade a seatbelt system on the paperwork side. The simplest is by STC with all the paperwork included. The second is as a minor modification. This can happen when there's an existing hardpoint or framework where the seatbelt can be attached. AC 23-17B (page 105) makes it clear that this method is acceptable for aircraft manufactured without shoulder restraints. The third method is by field approval, which is required if any welding or drilling is involved.

Many local shops have the authorization and ability to repair your existing belts or find STC kits for you, but here's a rundown of what's out there so you can be a more informed consumer.

AMSAFE AND BAE (SCHROTH)

AmSafe supplies the seat restraint components for most major OEMs and about 65 percent of the aftermarket seatbelts. They don't sell retail, but if you just head for your local service center and ask them to redo your existing belts or replace them with new ones, it's likely you'll get AmSafe parts. Prices for those parts vary with the shop selling them, but our research shows they are on the high side of aftermarket seatbelts. AmSafe doesn't offer any STC systems directly.

Schroth Safety products is now part of BAE systems and can be thought of as the German AmSafe.



They manufacture belts for many industries and are widely regarded as making quality products. They hadn't responded to our queries by press time, but they do make systems that could be installed under a field approval or as a replacement. We don't know of any STCs, however.

AERO FABRICATORS

The company is a division of Wag Aero that rewebs old belts and supplies new ones. They stock eight colors and can do three-inch military-style belts found on many aerobatic and ag aircraft. If you're completely replacing the old belts, they offer static (non inertia-reel) two-, three-, four- and five-point systems. As with almost all of the belt companies we talked to, the parts are TSO/PMA belts that should be a legal replacement for many existing systems.

For aircraft with no shoulder harness, or for those looking for the added safety from a four-point harness, Aero Fabricators offers upgrade kits via STC. These are Y-type four-point systems, meaning the shoulder belts are attached at a single point with one strap that splits into a Y-shape to go over each shoulder and connect to a lap belt. They cover common Cessna 100 and 200 aircraft, cloth-covered

Pipers, as well as the PA-24 and PA-28 series, Beech 35s, and some Stinson and Aeroncas. Kits range from \$170-\$299 per seat. PA-28s are \$496 for a front seat pair. The systems are front and rear for tandem aircraft, but only the front for others.

John Armes, who oversees belt repair and new manufacture as part of his duties at Wag Aero, tells us they have gotten many shoulder harness

We think a four-point restraint with inertia reels, such as this BAE system, is worth the extra cost.



AMSAFE AIRBAGS: THE ULTIMATE SEATBELT UPGRADE?

"We want to raise the bar. We want to take safety to that next level," says Joe Smith, VP and Product Line Manager for AmSafe. Translation: We want to sell you an airbag system for your airplane.

The same service centers that can repair your belts with AmSafe parts can take it a step further and install aftermarket airbags via STC for dozens of aircraft, with more models being added regularly. The PA-24 is being finalized as we go to press. Not all models have approved systems for all seats; some are just the front seats. AmSafe will also work with homebuilders who want to install airbags.

While a more complex upgrade than just adding a shoulder harness, the system is surprisingly simple. The airbag is built into the shoulder or lap belt and inflates up and away from the occupant. Smith tells us this makes it safer for a wider range of body sizes and weights.

The two other major parts to the system are the inflator,



which is often stored in or under the seat, and the electronics module assembly (EMA) that contains the crash sensor. Each EMA sits under the exact seat it inflates so the inflation happens just as the crash pulse reaches that seat. Inflation time is usually less than 90 milliseconds. The EMA is based on an automotive unit, but is retuned for the forward and downward pulse of an aircraft crash. The complete system weighs about two pounds per seat.

Final parts cost is set by the installing shop, but Cutter Aviation in Arizona was kind enough to help us out with some ballpark prices. They estimate \$3500-\$4000 in parts to put airbags in two front seats, plus about eight hours labor (some aircraft are easier than others). There's a yearly field test of the system and two mandatory replacements. The EMA gets refurbished after seven years (\$375) and replaced after 14 years (\$575). One EMA can serve up to three seats. Each seat has its own inflator that must be replaced after 10 years at \$350 each. It's about a two-hour job to replace an EMA and an hour to do each inflator.

There's solid lab data showing these systems *should* improve survivability, but limited real-world proof. The NTSB can only point to two cases where the bags probably improved the result. However, there aren't any known instances of the airbags causing injury themselves. That's more than can be said for automotive airbags. There are about 10,000 GA aircraft flying with these systems installed. Time will tell.

You can see videos of the installation and deployments at www.amsafe.com/videos.



systems into other aircraft under 337 field approvals. It's particularly easy with a cloth-covered aircraft because there's usually a steel tube somewhere convenient to attach the Y-strap. For aluminum aircraft, it can be more difficult, or even impossible to find a suitable attach point (especially for shoulder harnesses in the rear seats).

ALPHA AVIATION

Alpha Aviation sells both replacement seatbelt equipment and aftermarket upgrades to three-point belts using AmSafe equipment. The replacements cover much of the Cessna 100- and 200-series aircraft, almost all of the Mooney line and inertia reels for many Pipers that had factory inertial reel systems.

Black, grey and tan (fawn) belts are stocked, but custom colors are available for no extra charge. Inertia reel shoulder belts run under \$350 per seat, making them a reasonable option to upgrade an aging factory-installed static system.

The aftermarket upgrades are three-point systems STC'd for Piper PA-23, -24, -28, -30, -32, -34, -39 and -44; common Cessna 100s and 200s, most Beech 33s, 35s, 36s, 55s, 58s and 95s; and the Ercoupe. No, we don't know how the Ercoupe got into the mix, either. Static systems run \$629-\$729 per pair of seats. Inertia reel systems are \$829-\$1029. That makes them one of the best deals for a complete STC system. They are only available for the front seats, however.

AIRCRAFT BELTS

This company makes the reweb or replacement process about as easy as possible with an excellent online ordering system for both options. There are 30 standard colors and a few buckle types to choose from, with custom colors or specialty items (like gold plating) available on request. If you're rewebbing, they make it easy to order a bit more (or less) seatbelt length in the process.

Prices are a bit higher than average, with a three-point system running just under \$150, but the ease of ordering and selection may make a slight premium worth it. Aircraft Belts does not offer STC'd kits to upgrade old lap belt systems (although they make the three-point upgrade kit sold by Cessna). Their equipment



Replacement belts can seriously pimp your ride if you want, such as these from Aircraft Belts.

could be installed under a field approval, of course.

AVIATION SAFETY PRODUCTS

Aviation Safety Products focuses on rewebbing existing systems, with 26 colors to choose from and options for custom plating. As of this writing, they have some of the best prices we've seen for mail-order rewebbing, at \$43 for lap belts and \$49 for an associated (non-inertia-reel) shoulder harness.

They also build custom systems for experimental homebuilt aircraft, again with competitive prices. A custom three-point static system might be \$160. A five-point with a rotary release could run over \$500 however. The company uses components from other major seatbelt makers, such as AmSafe and BAE (Shroth).

BAS

BAS is a family company in Washington State (call and you'll likely get Jim Mettler Sr. or Jr.) specializing in four-point upgrades for the front seats of many Cessnas, Beeches, Pipers and the Luscombe 8-series. Installation time ranges from two to 10 hours.

Much of the BAS system is AmSafe equipment. These are inertia-reel systems and are sold in pairs of two seats at \$1100-\$1300 for the pair. This is more expensive than a three-point system, but also more protection. The company has some impressive wreck photos with testimonials on their website. The belts can be ordered with the shoulder straps fixed to lap belt sides, or as a slide-on type that becomes four separate straps on disconnect. A rotary buckle can be

ordered for \$350 extra.

BAS also sells three-point, static systems for the middle and rear seats for aircraft that have factory hard-points, such as the

K-R modes of Cessna 210 and post-1971 Cessna 172s. These are \$395 per pair.

They don't advertise this product, so you have to ask for it. The company has done custom work for Beavers and Helio Couriers as well.

HOOKER HARNESS

Hooker Harness has long been a favorite of the experimental, aerobatic and warbird community. They also do some OEM work. If you're lucky enough to fly a new Waco biplane, that's a Hooker harness.

The company offers STC kits for static four-point systems in most high-wing Cessnas for \$225 per seat. They also offer four- and five-point STC'd static systems for the Aeronca Champ and its derivatives for \$200-\$280. They do have inertia reel systems, but only for experimentals.

Hooker also offers their \$55 quickie harness for lap-belt-only aircraft. This is actually Y-strap that has loops on all three ends. You thread the rear seat lapbelt through the single strap's loop and tighten. Then you thread the two halves of the front lap belt through two forward loops and climb in. This effectively makes a shoulder restraint anchored by the rear seatbelts. It also makes the rear seat unusable for passengers, but many owners don't use them anyway. Because the Quickie isn't permanently attached, there's no paperwork at all. Co-owner Scott

Mc Phillips says it's popular with ferry pilots flying aircraft without modern seatbelts.

KOSOLA AND ASSOCIATES

If you're flying a Piper product, you can get three-point systems with either static shoulder belts or inertia reel from Kosola and Associates. Their STCs cover the J-3, PA-11, -12, -24/30 and -28. A nice plus of the Kosola STC is that they cover both front and rear seats in almost all models.

The systems are pricier than most, running \$428-\$550 per seat for static shoulder harnesses and \$672-\$840 for inertia reels and black webbing. Custom colors are \$50 more per seat. If you order for certain kits, such as the PA-24 Comanche, you have to know the serial number and rivet pattern before you order. Diagrams are on their website. The company says installation times are often about four hours.

WORTH THE MONEY

Pilots rarely think about seatbelts other than as startup checklist item number two. But worn belts are a risk with no accompanying benefit, given how reasonable rewebbing a system can be. Even if hardware has to be replaced, we think it's a no-brainer to make sure this basic safety equipment is up to the potential challenge.

We also think that any seat regularly occupied by humans should have a shoulder restraint of some kind if at all possible. Our pick would be an inertia reel, four-point system, and for this reason we like BAS. But anything that improves your odds of walking away from a bad day is money wisely spent.

CONTACTS

Aero Fabricators
800-558-6868
www.aero-fab.com

Alpha Aviation
800-653-5112
www.alphaaviation.com

BAS Inc.
888-255-6566
www.basinc-aeromod.com

AmSafe
602-850-2850
www.amsafe.com

Aviation Safety Products
800-480-4816
www.aircraftseatbelts.com

Hooker Harness
815-233-5478
www.hookerharness.com

Aircraft Belts
800-847-5651
www.aircraftbelts.com

BAE (Schroth)
954-784-3178
english.schroth.com

Kosola and Associates
229-435-4119
www.kosola.com

Piper Super Cub

After 60 years, it's still the top dog for outback flyin' and fishin'. And, unlike other airplanes, it has held its value in a down market.

While Alaska's official bird is a pretty two-tone number called the Willow Ptarmigan, the state bird that works for a living is the Piper Super Cub. For reasons related to perfect timing, a marriage of the right powerplant to a robust airframe and sheer, stubborn staying power, the Super Cub has earned what seems to be a permanent home in bush community.

Other aircraft can arguably outdo the Cub in payload capability, speed and cabin space, but the Super Cub simply holds its own in an economic combination of all three that's hard to beat.

And we're told there's more than one Super Cub beating around the bush with only one original part: the aircraft data plate.

Whether that's true or not, the Cub's prices on the used market are a testament to its popularity. A good late-model example—say 1980s forward—fetches in the mid-70s, but some go for more than that. Super Cubs remain a popular choice in the sports/recreational market for pilots who like to fly to the remote outback for fishing and hunting, but who aren't bush pilots.

Where many Super Cubs are earning their keep by routinely being overloaded and packed to the gunnels and launched from mere specks of somewhat level ground, water, ice or snow, a special few have been tricked out by their owners into gleaming showplanes, worth well over \$100,000.

In the hands of a pilot who's aware of its limits, a Super Cub can do about anything, except go fast.

With their monster engines, these airplanes can easily win the local short-field takeoff competition, at least until Cub Crafters started taking its Carbon Cub to the contests. How can one airplane be so many things to so many people?

In the hands of a pilot who's aware of its limits, a Super Cub can do about anything, except go fast. (Being comfortable might require some aftermarket work.)

Because it's so versatile, delightfully fun to fly, not terribly expensive to operate and possessed of what can only be called the Cub cachet, a PA-18 holds its value better than almost any other airplane.

Because there are so many modifications to PA-18s, legal and otherwise and because a significant proportion have been worked hard and put away wet, so to speak, finding a good one requires the willingness to do homework and have a pre-purchase inspection performed by someone who knows the marque.

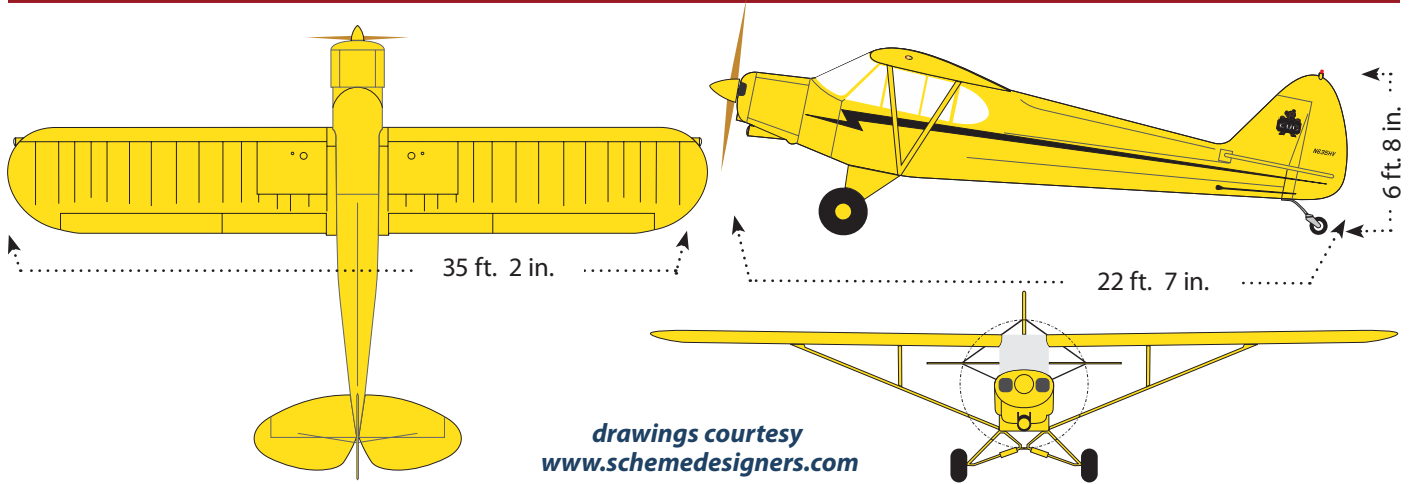
MODEL ORIGINS

The Super Cub's family tree grew from the 1935 E-2 Cub, which, once the cockpit was enclosed and a slightly larger engine installed, became the J-2 and in 1937, the J-3 Cub. Mimicking the yellow-and-black paint scheme to compete with the popular Aeronca C-3 and with more room and better performance, the Cub sold in droves, reaching its production peak in 1946.

In 1948, it was spruced

Photo by Darin Meggers

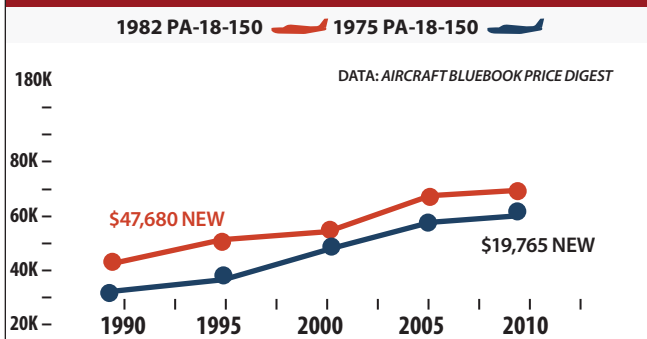
PIPER SUPER CUB



PIPER SUPER CUB MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1950-1955 PA-18-95	90-HP CONT. C-90-12F	1800	\$16,000	18	700	85 KTS	±\$37,000
1956-1961 PA-18-95	90-HP CONT. C-90-12F	1800	\$16,900	18	700	85 KTS	±\$38,500
1950 PA-18-105	115-HP LYC. O-235-C1	2000	\$21,000	36	675	96 KTS	\$38,500
1951-1952 PA-18-125	125-HP CONT. O-290-D	2000	\$17,000	36	655	97 KTS	±\$41,000
1952-1954 PA-18-135	135-HP CONT. O-290-D2	1500	\$17,000	36	872	95 KTS	\$42,500
1955-1960 PA-18-150	150-HP LYC. O-320-A2A	2000	\$21,600	36	804	100 KTS	±\$44,000
1961-1978 PA-18-150	150-HP LYC. O-320-A2A	2000	\$21,000	36	804	100 KTS	±\$59,000
1979-1981 PA-18-150	150-HP LYC. O-320-A2A	2000	\$21,000	36	804	100 KTS	± \$70,000
1982-1990 PA-18-150	150-HP LYC. O-320-A2A	2000	\$21,000	36	804	100 KTS	±\$75,000
1991-1994 PA-18-150	150-HP LYC. O-320-A2A	2000	\$21,000	36	804	100 KTS	±\$87,000

RESALE VALUES



SELECT HISTORICAL ADS

AD 99-01-05	WING STRUT/FORK INSPECTION
AD 85-06-04	FUEL TANK TUBING LEAK
AD 78-10-03	FUEL CAP VENTING MODIFICATION
AD 68-05-01	MUFFLER PRESSURE TEST
AD 62-02-05	RUDDER CABLE ATTACHMENT LUG

SELECT MODEL COMPARISONS

PAYLOAD/FULL FUEL		CRUISE SPEEDS		PRICE COMPARISONS	
PIPER SUPER CUB	~700	SUPER CUB	~110	SUPER CUB	(\$60,000)
AVIAT HUSKY	~700	AVIAT HUSKY	~110	AVIAT HUSKY	(\$59,000)
PIPER J-3 CUB	~700	PIPER J-3 CUB	~110	PIPER J-3	(\$35,000)
AERONCA 7AC	~700	AERONCA 7AC	~110	AERONCA 7AC	(\$21,500)
TAYLORCRAFT F21B	~700	TAYLORCRAFT F21B	~110	TAYLORCRAFT F21B	(\$27,000)

up and renamed the PA-11. The PA-18 Super Cub model appeared in 1950, although the first, the PA-18-95, was little more than a PA-11 with a 90-HP Continental. Coincidentally, the PA-18-105 debuted with a 115-HP Lycoming, flaps, a counterbalanced elevator and other features that separated the Super Cub from its ancestors.

In 1951, the O-235 was replaced with a 125-HP O-290; in 1952, that engine got souped up to 135 HP. Finally, in 1955, the Super Cub got the engine that it really deserved: a 150-HP Lycoming O-320-A2A, which it kept until Piper dropped it from the line in 1994. The Super Cub remained essentially unchanged

The panel of Steve Johnson's Top Cub fits the backcountry VFR mission—good engine gauges and a GPS. The heel brakes require some time to master, but they allow for aggressive rudder use with no risk of accidentally applying the brakes.

throughout its production run.

All Super Cubs carry the PA-18 designation. Those originally fitted out as agplanes were called PA-18As; these should be looked on with caution, because of a likely history of hard use and exposure to corrosive chemicals.

Changes and options to the Super Cub were few over the years and came, as in the old VW Beetle, only as necessary improvements. Here's a list of some of the more important functional changes:

- In 1961, an optional metal belly pan was made available on all Super Cubs. (Previously, it was supplied only on the cropdusting versions.) The mod also includes a beefed-up lower rear fuselage. The option is a good one, but watch out. Many of the airplanes ordered with it were used as chemical sprayers, and the structure may have suffered corrosion as a result.

- About 1965 (even Piper couldn't tell us the exact date),

zinc chromate anti-corrosion treatment was added to the wings. If you're considering a mid-60s model, remove an inspection cover and check the color of the metal. Yellowish green is good, anything else is not so good. At the same time, Piper beefed up the fuselages with more 4130 steel and heli-arc welding.

- In 1971, Piper switched from Grade-A cotton fabric covering to long-lasting Ceconite. Although cotton shrinks less in cold weather, it has a shorter lifespan, from three to a maximum of 10 years. Ceconite, by contrast, will last 10 years under most conditions and can go much longer than that if pampered.

- In 1976, the old visual float fuel gauges were replaced with panel-mounted electric gauges. Although they are neater looking, pilots tell us the old gauges are more accurate and reliable.

- In 1977, Piper switched from the old-style DC generator to a 60-amp alternator. The alternator is retrofittable to older models, however, and is a desirable feature for Super Cubs equipped with multiple radios, strobes and other electrical gear.

- In 1978, the ailerons were changed from fabric to aluminum. Although cheaper to fabricate, the metal surfaces are not so easily repaired, a problem for bush operations. Like the alternator, the metal ailerons are retrofittable to older airplanes. The year 1978 also saw a switch to more powerful and reliable Cleveland brakes, a partial solution to the Super Cub's long-standing awkward and ineffective heel brakes. These are also retrofittable to older aircraft.



Here's a fairly stock Super Cub, meaning it only has aftermarket tires, propeller and an added belly baggage pod. (Photo by Sarah Dickerson.)

Like many other airplane models, the Super Cub died in the Big Slump that hit general aviation in the early 1980s. In 1981, Piper sold off the marketing of the Super Cub to a Texas company called Wes-Tex, for which Piper manufactured airplanes to order in lots of 50 or so. That arrangement lasted only two years and production of the PA-18 line ceased altogether in 1983 after a total run of 33 years and 8442 aircraft.

In an attempt to revive the line in 1988, Piper announced that it would resume production of the PA-18, and even offered an innovative new purchase scheme designed to hook into the successful homebuilt industry: A buyer could purchase a Cub kit and build it under factory supervision.

The kit idea really never took off, at least in part because of Piper's financial troubles. The option was dropped after a couple of years and today owner-assembled airplanes are valued at some \$12,000 less than their factory-assembled peers.

Production of new Cubs continued, sort of; three were built in 1988, 49 in 1989, seven in 1990, none in 1991 (bankruptcy) and only one in 1992. The line ramped up in 1993; and 108 were built before production was stopped entirely after the 1994 model year. The emergence of New Piper divorced the company entirely from anything to do with new Cubs.

MARKET SCAN

Simply put, the Super Cub holds its value extremely well. Scanning values in a recent Bluebook, we note that even recent models are worth more than their new list price, although inflation isn't figured into the numbers. If a bargain comes on the market, it's wise to check carefully for serious corrosion or other hidden

Dakota Cubs offers the Super 18, which is basically a high-performance Super Cub. They also supply Super Cub parts, including wings. (Photo by Amy Gesch.)



surprises. There are not any inexpensive Super Cubs.

A 1975 model, for example, sold new for \$19,700, but in 2011, Bluebook gives the average retail as \$65,000, a bit more than it was the last time we reviewed the Super Cub five years ago. Trade-A-Plane shows listings in the 90s, with some asking prices well north of \$110,000. Some of these are equipped with color mapcoms and GPS.

For comparison, consider the Aviat Husky, an airplane designed to compete directly with the PA-18, but equipped with 30 more horsepower. A 1989 Husky's average price when new was \$63,400 and is now worth \$61,000. A similar-vintage Super Cub sold new for just over \$56,000 and is

now worth nearly \$80,000, according to the Bluebook.

In 1980, we commented on the excellent resale value of the older models and went on to state: "It's not likely that the current production Super Cubs will do as well; the current new price of \$30,000 is highly inflated and it's doubtful that a 1980 Super Cub purchased today will ever fetch \$30,000 again (assuming reasonable inflation rates)."

Well, guess what? The current value of a 1980 Super Cub is \$70,000. Checking the inflation tables, \$30,000 in 1980 dollars is about \$78,000 in 2011 dollars.

PERFORMANCE

It's not hard to imagine what hap-



pens when you put a big engine and a big wing on a light, two-place airplane: STOL performance to burn and this is why people buy Super Cubs. Although bigger, more complex and more expensive aircraft like the Helio Courier have established excellent reputations for STOL performance, if you ask the people who really use them—the bush pilots, the cropdusters, the outback charter pilots—the Super Cub is usually considered the ideal STOL airplane.

One Alaskan bush pilot summed it up this way: “Owning the Super Cub is like owning a vital share in the Alaska bush flying arena, if there is such a thing. Knowing that it is the Super Cub that pioneered true off-airport operations in terribly rough terrain and continues to hold its own as the king of STOL working bush-planes. That’s just my opinion, based mostly on working them and the simple fact that it is the most widely used airplane here when I look around the bush flying community.”

It comes from this: Book take-off roll at gross weight is 200 feet. Heavily overloaded, a Super Cub may grind along for 300 feet before becoming airborne, pilots tell us. Now, with the addition of VGs and progressively larger engines, takeoff rolls in the double digits on calm days are being reported.

Book rate of climb is 960 FPM, although that’s at 50 MPH, which generates a climb gradient of some 22 percent. That claim might be viewed with at least a raised eyebrow, given our examination of Super Cub

accidents—many involved hitting an obstruction after takeoff or stalling while trying to clear an obstacle. Either that or optimistic pilots are given to try and get more performance out of Super Cubs than was ever built in.

The tradeoff, even with lots of power, is that a Super Cub is not going to get anywhere quickly. Figure on cruise speeds in the 100 to 110 MPH range on 8 to 8.5 GPH.

PAYLOAD/RANGE

Let’s be upfront here. Discussing the legal loading of Super Cubs is enough to send working pilots into knee-walking howls of laughter. The PA-18 is probably overloaded more consistently, by bigger margins, than perhaps any other airplane than the Husky, which has the same space and a smaller legal payload.

Yes, we hear the ivory-towered safety set tut-tutting at us. However, they overlook the need for a pragmatic approach to professional aviation, particularly in the back country, and probably wouldn’t know a Super Cub if it leaked oil on them.

They don’t take into account that the 150-HP Super Cub has the same engine as the Cessna Skyhawk had for many years as well as a bigger wing, but a gross weight of 550 pounds less. “Overload” a Super Cub by 550 pounds and you’ve still probably got more climb performance than a grossed-out Skyhawk. In these days of marketing hype, the word “Super” can still mean something.

In the context of tailwheel air-

planes, with their designed-in instability on the ground, unforgiving nature in crosswinds, poor visibility in three-point attitude and willingness to bounce unless the landing is just right, the Super Cub may be easier to handle than most. It has no built-in bad habits on the ground, although the heel brakes can be challenging to the newcomer. It has very good visibility over the nose from the front seat, from which it is soloed. Not so the back seat.

So long as a pilot is willing to learn how to fly a tailwheel airplane and give it his or her undivided attention on landing and takeoff, the Super Cub is capable of handling strong winds and challenging landing areas safely. That being said, the loss of control accident rate for the Super Cub is awful. The heel brakes come in for some share of the blame, but tailwheel airplanes are more demanding than nosewheel models.

Because many of the Super Cub landing and takeoff accidents we reviewed occurred at off-airport sites and because the PA-18 is so capable, it may be causing pilot egos to write checks their skills can’t cash by attempting to operate on strips that are simply too short or too narrow for the pilot to handle.

In the air, the Super Cub flies like a Cub. That’s good and bad. It does

The famous Valdez contest for short takeoffs and landings. Yes, that’s the entire allowable area for takeoff. (Photo by Joe Prax.)



handle as nicely as a Cessna 150, for example, but it's generally easy to fly for a 1930s design, harmonized in pitch and yaw, but ponderous in roll. It's forgiving in all phases of flight except for an uncontrolled stall and there is virtually no stall warning.

Inflight handling does not change much when either floats or skis are swapped for wheels, something that makes it a good airplane for pilots transitioning to floats or skis. Its lack of dihedral means it has no roll stability. Bags of adverse aileron yaw require that a pilot learn to use the rudder, something that is essential when maneuvering because it is vicious in an uncoordinated stall, rolling rapidly and losing 300 to 400 feet of altitude quickly.

This behavior has killed more than a few folks engaged in pursuing wildlife at low altitude and who didn't keep the ball centered when yanking and banking. In Alaska, the resulting low-altitude stall, roll and dive into the ground has gained the appellation, "moose stall." We were told by a number of pilots that the installation of VGs makes an uncoordinated stall much less exciting, taming the roll and nose drop.

Admission should be charged to the comedy routine that is a first timer entering a Super Cub. Once inside, legroom is poor while shoulder and headroom is more than adequate. Stock seats become quite uncomfortable after a couple of hours of flight. After-market seats can improve the situation dramatically. Baggage room is limited to a shoulder-width compartment behind the rear seat. Visibility is perhaps poorer than you'd expect from a tandem high-wing, but you'd be right to expect quite a lot. Noise damping in flight is almost non-existent.

MAINTENANCE

Generally, the Super Cub is a rugged and robust airplane that's easy to fix in the field. Annual inspections typically run in the \$500 to \$700 range, although some get by for next to nothing if the owner does a lot of the work himself. On the other hand, the fabric covering and steel tube fuselage means that the potential for catastrophic annuals is always just around the corner. Corrosion is becoming an increasingly serious concern as the airframes age.

Derek DeRuiter of Northwoods Aviation in Cadillac, Michigan, a company that has long operated Super Cubs on wheels, floats and skis, reported that their Super Cubs are easy to maintain and that switching from wheels to floats takes only three hours compared with more than ten for a Husky. Further, installing wheel skis takes only an hour. He also reported that parts have always been readily available, a definite consideration when purchasing a vintage aircraft.

According to Super Cub mechanical mavens, here are some specific potential trouble spots to look for when considering any used PA-18 for purchase:

- Corrosion in the steel fuselage tubing and wing struts and forks. Particularly check the lower rear tubes, and be extra careful if the plane has done any spraying duty.
- Fatigue cracks in the threaded clevis bolts on the wing struts.
- Worn-out landing gear hinge and shock strut bolts and bushings. The Super Cub gear is likely to have taken a frightful pounding over the years; inspect it closely.
- Worn top rudder hinge bushing, especially on aircraft with rudder-mounted beacons.
- Loose or worn-out elevator trim jackscrew, especially in aircraft used for glider or banner towing.

Another item to consider: Find out the airplane's service history and inspect accordingly. Try to avoid airplanes used for glider or banner towing or cropdusting. If it served as a bushplane, check the landing gear carefully and double-check the accident history and repair log.

Pipeline patrol is easy on engines but tough on wings because of the constant turbulence at low levels. And remember that tailwheel airplanes such as the Super Cub are likely to have a groundloop history, so check for hidden wingtip damage.

There's a significant AD on the wing struts, AD 93-10-6 (this was once two ADs, 77-3-8 and 81-25-5). Part of the AD calls for annual inspections of the struts for corrosion, as well as treatment with a rust inhibitor (linseed oil). The service bulletin the AD specified using a Maule punch tester on the strut; however, some mechanics doubt the effectiveness of this test.



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The other part of the AD addresses the lift-strut forks. According to the AD, the original machined-thread forks were prone to fatigue cracking. The fatigue apparently originated at the bottom of the thread grooves, which were very sharp. The problem was exacerbated by people using the struts as steps when getting in and out of the airplane.

The AD calls for Magnaflux inspection of the forks to detect cracks, with the inspection repeated every 500 hours thereafter. If no cracks were found, then the forks could be returned to service if they had less than 2000 hours on them (1000 hours for floatplanes or any airplane that had been on floats at any time in its life).

MODIFICATIONS

Jimmy Durante said, "I've got a million of 'em." That's also a good description for the number of mods

available for Super Cubs. We recently reported on VGs and owners swear by them on the PA-18 for stall speed reduction and improving stall behavior. Safety cables, attached to the landing gear to keep it from collapsing should a bungee or strut fail, are popular. Shoulder harnesses retrofits are a must, in our opinion. Tundra tires, baggage pods, wider cabins, even nitrous oxide injection is out there for sale. To get feedback from users, we recommend going to www.supercub.org, which has become the de facto place to be for those interested in the Super Cub. The site is a wealth of information for Super Cub owners. Steve Johnson runs www.supercub.org, the website for information and conversation on the PA-18.

Cub Crafters builds a "Top Cub" which is modeled on the Super Cub, but certificated under FAR 23. And since our last report, it has introduced the Carbon Cub in the

LSA category, with a 180-HP ASTM-approved engine. The airplane stomps the competition at Alaska's STOL contests—but it can't carry 500 pounds of elk meat.

Although it bases the designs of its airplanes on the Super Cub, CubCrafters significantly altered and improved the airframe, so few if any of the parts are interchangeable with a PA-18. However, CubCrafters does specialize in Piper Super Cubs and will completely rebuild them or install many of the numerous available mods. Contact Cub Crafters at www.cubcrafters.com.

OWNER FEEDBACK

My 1964 Super Cub was totally restored in 2000 with Wipline 2100 amphib, 160-HP and numerous other mods. The aircraft is low maintenance with 400-plus hours since major overhaul. It burns about 9 GPH and VGs give it a 28 MPH

ACCIDENT SCAN: LOSS OF CONTROL

Runway loss of control (R-LOC) was the uncontested champ for accidents in our review of the Super Cub, with over half the accidents being R-LOC of one kind or another. This has to be taken in context, however. It's common for these accident reports to read like a guy-walks-into-a-bar joke: "The pilot stated that he was landing the ski-equipped airplane on a glacier when ..." or "The pilot reported that he was departing from a rough, 700-foot-long, dirt-covered off-airport site with a load of Caribou meat ..."

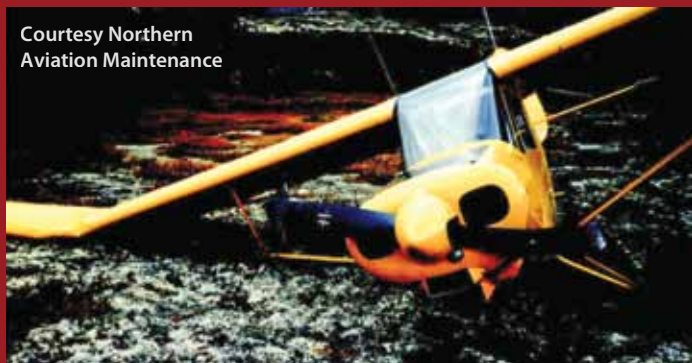
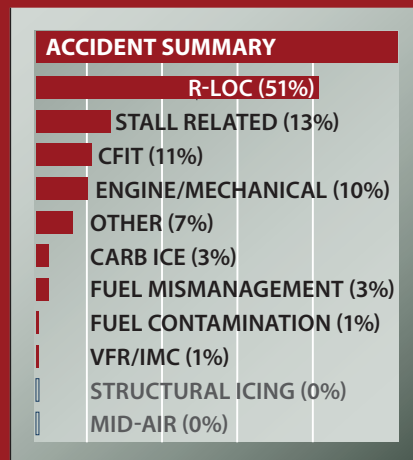
The point is that Super Cubs are routinely operated from terrain many pilots would consider unsuitable for walking across. It's no surprise that half of the accidents in our report occurred in Alaska. Perhaps what's most impressive is that almost all of these accidents were non-fatal, even ones that occurred on takeoff involving not clearing the trees. Pilots inadvertently braking or

losing control in crosswinds were both prominent.

Stall-related accidents pulled the second slot, but more were related to botched go-around attempts than low-speed, high-loading turns. Predictably, these were more deadly.

Controlled flight into terrain (CFIT) is usually an IFR issue, but we're tweaking it here for the surprisingly common accident of getting caught in downdrafts that even a Super Cub couldn't outclimb, resulting in controlled flight right into the ground.

The remaining hit list was fairly even and typical for any airplane. Getting the fuel from spare tanks to the engine confounded some pilots, overlooking carb heat bit several others. Banner towing revealed itself as a hazardous way to build flying time. And there were a higher-than-normal number of drunk or even uncertified pilots wrecking perfectly good airplanes. The airplane may be super, but it's not invincible.



Courtesy Northern Aviation Maintenance

Tundra tires, floats and skis are all at home on a Super Cub. They can use regular wheels, too. (Photo by Gordon Richardson.)

docile stall. The aircraft works well on the water, getting off in eight to 10 seconds. Insurance runs \$2400 a year.

We own four aircraft and the Super Cub is by far the most fun.

Gordon Richardson
Caldwell, Texas

The Super Cub performs great with any gear configuration, wheels, floats, amphibious floats, skis and wheel/skis, always having short take-offs and landings and a good climb rate. We do a great deal of seaplane instruction and students learn to fly the airplane quickly, as it is easy to fly, but challenging to fly well.

It is easy to maintain and it is easy to completely rebuild it to be better than new. There are a huge number of STCs available, with the auto fuel STC being important for float operations.

On the downside, it has limited room for people and baggage, and it's hard to get in and out of the cockpit. Cruise is slow, especially with a seaplane prop and the cost of buying one is very high, because of the nostalgia of the Super Cub. It will fly into the stall with little warning, and you must keep the rudder coordinated.

I enjoy flying both the Super Cub and Husky. They are very similar in design and function. Aviat did a great job with the Husky, improving on the pattern of the Super Cub. In the end, however, I would choose a well-restored and equipped Super Cub over a Husky.

Derek DeRuiter
Cadillac, Michigan

Maintenance on a good Super Cub in dry Wyoming is relatively painless and annuals run in the neighborhood of \$450 to \$650. Being a fabric-covered aircraft leaves the door open for substantial repair in the future. Care and maintenance is reflected in the lifespan of the fabric.

The Lycoming O-320, 150 HP is nearly bulletproof provided it is run



on a regular basis and receives scheduled oil changes. It will digest about any fuel you feed it. We see 106 MPH at 2475 RPM, burning 8 to 8.5 GPH. Admittedly not something that will light your hair on fire, but the Super Cub's beauty is in its slow flight characteristics and its ability to get in and out of short, unimproved strips that would drench the underwear of a pilot flying anything else.

Ray Dennis
Casper, Wyoming

I am a born and raised Alaskan and I use my 1977 PA-18-150 Super Cub to make a living seasonally here in Alaska. I have been doing this for approximately 10 years, mostly using my airplane for off-airport operations in direct support of big game guiding here in Alaska.

My airplane has been modified with the Piper L-21 factory window specifications and fish spotting was the reason that I installed this mod. It is superb, to be able to see aircraft in close vicinity at my six o'clock and in combination with a skylight and glass door, I have better visibility in the Super Cub than in any other aircraft I have flown.

Now I use the airplane for exclusively off-airport operations, leasing it to a guide service by the hour and employed by the company as a guide/pilot to fly my airplane. With tundra tires, a borer propeller and a Firmin cargo pod, this airplane is, in my opinion, unbeatable as an all-around bush/off-airport aircraft.

In thousands of hours of flying, I am still amazed at the places that my airplane will go into and out of safely, in varying load conditions,

usually heavy. I have landed my Super Cub in less than five feet ground roll in winds gusting over 50 knots, and, although it was exciting, the airplane was right at home. Owning the Super Cub is to me like owning a vital share in the Alaska bush flying arena, if there is such a thing.

Andy Flack
via e-mail

We are coming up on our 11th anniversary of SuperCub.Org, the on-line information resource that I started to spread the good word about Super Cubs.

Now it encompasses a wide variety of aircraft that are used for similar purposes, and has become a community of folks interested in flying, building, and maintaining a number of similar aircraft.

SuperCub.org today has over 1500 donating members (membership is a \$25 or greater donation annually) over 7000 registered users (you are not required to be a member to access much of our site, and over 120,000 different computers per month visit the site). Presently, about 15 percent of our audience is international, and 35 percent from Alaska.

I have flown over 60 different Super Cubs equipped in many different ways and have found it to be one of the most honest and enjoyable airplanes to fly. The versatility of this airplane is unmatched by anything.

Steve Johnson
Kansas City, Missouri

Special thanks to Steve Johnson for his help collecting the photos for this article.

Factory Engines

(continued from page 11)

waiting for an overhaul. In Lycoming's case, one added benefit is the option of roller rockers in the new engine and a 24-month warranty that, for some operators, could cover the engine to TBO. The larger percentage of new parts content in factory engines is also a net plus, in our view. You'll pay more for this, but new cylinders—especially Lycoming cylinders, about which we heard not a single complaint—seem more likely to deliver trouble-free service.

On the other hand, the best engine shops provide support and often meet customers halfway on problems that crop up past the formal warranty, something less likely to happen with factory warranty service.

One solution is to do what one Cirrus SR20 owner did. Work with an engine shop that's also a factory distributor.

"I had problem after problem with quality issues and Continental was no help. Thank God for Penn Yan Aero! As a factory distributor, they were able to make things right for me. But not without a serious amount of work, for which I'm sure they received little compensation. When this engine is timed out, Penn Yan will overhaul it."

Buying into NextGen

(continued from page 7)

aircraft and 1090ES aircraft can only see 1090ES aircraft. If the majority

of aircraft have 1090ES and you have UAT, you're blind to them and they can't see you. (Except with eyes, of course.) But don't worry, no-radar only happens down low, like around uncontrolled airports, right?

We think this makes 1090ES the more practical solution, assuming you have a suitable GPS to drive it. You could use 1090 MHz for your ADS-B out and traffic in, and get the free weather independently with a separate 978 MHz receiver (no transmitter). SkyRader LLC and NavWorx sell portable units that display weather on iPads and the like for \$950-1400.

Garmin, Avidyne and FreeFlight all indicated they are considering certified ADS-B receiver-only devices, similar to an XM weather receiver but without the monthly subscription cost. The 978 MHz band has lots of bandwidth that could be used for all sorts of as yet unplanned data, so it's far from dead as a resource even if it's not used for traffic. That said, ADS-B weather isn't quite as capable as XM weather. You must be airborne to receive it, and it only shows weather with a given range of your aircraft (see AIM table 7-7-1 for details). Pressure from competition could spur WXWorx to expand their XM weather offerings.

The ADS-B rule allows for an aircraft to broadcast ADS-B on 1090MHz and listen for both traffic and weather on 978 MHz. That might make for the cheapest and most capable solution of all. You'd upgrade your transponder to a 1090ES model for ADS-B out and then just listen on 978 for both traffic and weather ADS-B In. This receiver could be an uncertified portable unit so long as it displayed on a

FEEDBACK WANTED

PIPER SENECA



For the February 2012 issue of *Aviation Consumer*, our Used Aircraft Guide will be on the Piper Seneca, a popular light twin. We want to know what it's like to own these practical twins, 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 you'd care to share. We accept digital photos e-mailed to the address below. We welcome information on mods, support organizations or any other pertinent comments. Please send correspondence on the Seneca by December 1, 2011, to:

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portable display. The catch is that the portable better have a rock-solid GPS position, however. There could be some engineering to prevent seeing your own ship as traffic as well.

The final rogue element here is that the 1090 MHz band is also used by transponders, TCAS, and FAA secondary radar. The FAA has been working to mitigate the potential for devastating frequency congestion as ADS-B gets added to the pot. According to Ted Lester, a Product Manager at Avidyne, the mitigations "will be pretty good, unless every GA pilot equips with 1090ES."

There was a knowing pause in the conversation as that thought sank in. Unfortunately, we might not know how much of an issue that is until the summer of 2019.