

# The Aviation Consumer<sup>®</sup>



## Three Cubs

The Cub idea endures in LSAs. How do they compare to the original?... page 4



Going up ... page 8



Not afraid of the ice ... page 12



Cool your stack ... page 15

**8 SOFT MARKET ENDS**  
*Insurance rates seem to have bottomed. Modest rises ahead*

**12 TKS REPORT CARD**  
*Owners tell us it works, and is worth the cost and mess*

**19 PRIVATE PILOT TEST PREP**  
*Sporty's and Gleim are our top picks*

**11 GROUND POWER UNIT**  
*They're a must for avionics training; start power is a plus*

**16 AVIONICS COOLING**  
*Don't believe anyone who tells you fans aren't needed*

**22 VIRTUAL HUD WINGMAN**  
*We're not sure a portable EFIS is useful, but it does the job*

## EDITOR

Paul Bertorelli

## MANAGING EDITOR

Jeff Van West

## CONTRIBUTING EDITORS

Jonathan Doolittle

Rick Durden

Larry Anglisano

## SUBSCRIPTION DEPARTMENT

P.O. Box 420235

Palm Coast, FL 34142-0235

800-829-9081

[www.aviationconsumer.com/cs](http://www.aviationconsumer.com/cs)

## FOR CANADA

Subscription Services

Box 7820 STN Main

London, ON SW1

Canada

Back Issues, Used Aircraft Guides

203-857-3100

**REPRINTS:** *Aviation Consumer* can provide you or your organization with reprints. Minimum order is 1000 copies. Contact Jennifer Jimolka, 203-857-3144

**B** AVIATION CONSUMER (ISSN #0147-9911) is published monthly by Belvoir Aviation Group LLC, an affiliate of Belvoir Media

Group, 800 Connecticut Avenue, Norwalk, CT

06854-1631. Robert Englander, Chairman and CEO; Timothy H. Cole, Executive Vice President, Editorial Director; Philip L. Penny, Chief Operating Officer; Greg King, Executive Vice President, Marketing Director; Ron Goldberg, Chief Financial Officer; Tom Canfield, Vice President, Circulation.

Periodicals postage paid at Norwalk, CT, and at additional mailing offices. Revenue Canada GST Account #128044658. Subscriptions: \$84 annually; single copies, \$10.00. Bulk rate subscriptions for organizations are available. Copyright © 2011 Belvoir Aviation Group LLC. All rights reserved. Reproduction in whole or in part is prohibited. Printed in the USA.

Postmaster: Send address corrections to AVIATION CONSUMER, Box 420234, Palm Coast, FL 32142. In Canada, P.O. Box 39 Norwich, ON NOJ1PO, Canada. Publishing Agreement Number #40016479

## FIRST WORD

### LSA: Still Falling Short

When the nuns were futilely trying to educate me at Saint John's Academy for the Perpetually Misguided, the monthly report card had a blank section for comments. These were meant to be well-intentioned encouragement for depressed parents who, upon seeing columns of Ds and Fs, understandably veered toward alcoholism, if not suicide. For my monthly dispatches of despair, Sister Salisha may as well have had a rubber stamp since she wrote the same thing: Paul's grades continue to fall short of his potential. (If you came of age during the 1960s, your report card said the same thing, unless you were one of those curve-busting nerds who ruined the academic careers of those of us who were too busy teaching ourselves to smoke behind the rectory to actually study.)

I think I feel the same way about the budding light sport industry. There's so much potential there but it is, thus far, unrealized. When we set off to cover the U.S. Sport Aviation Expo in Sebring in January, the one word that came to mind was stasis. There's just not much progress in this market and 2010, the hoped-to-be turnaround year, was actually worse than the dismal 2009. How can this be? What's wrong here? What is the industry doing wrong?

I'm not sure I can put my finger on it, but part of the problem is that there continues to be too many aircraft options for too few buyers. My theory is that this alone clips off some percentage of sales because would-be owners look at the field and find it too chaotic and fractured to make much sense of, so they do what buyers always do: They dither. I get a trickle of e-mail about this, asking me what I think of this design or that company. My guess is that these buyers are on the verge of writing the check, but decide to wait a while to see what's going to happen. (I believe the money is out there; the confidence is not.)

I doubt if there is a one-size-fits-all solution to this dilemma. Before it breaks loose, the economy will have to not just resume growth—it has already done that—but create employment, too. It's not that potential aircraft buyers are unemployed, but stories about persistent high unemployment erode the confidence some buyers need to feel comfortable spending north of \$100,000 for an LSA, or any other airplane, for that matter. It may be awhile before we see that, so the smart LSA companies are simply going to have to hold on until market conditions improve and until there are maybe half as many manufacturers as there are now. Personally, if I'm buying an LSA, I want the company selling it to be placing at least two or three a month into the market, or to have some other business mix that appears to make them viable. Only a handful of companies meet this acid test. Some of them are well-established with either allied kit businesses, or a diverse enough product line to constitute a real business plan.

I think the best potential exists in the training market. Last year, Tecnam's Phil Solomon told me that critical mass may occur when there are enough LSAs out there to populate dying airports with a real training fleet. His view—and I think he's right—is that there's no long-term potential for the industry if new customers show up only to be required to a 30-year-old Cessna 150 with shabby plastic and faded paint. Starting students simply aren't going to be impressed by that. I'm certainly not and I grew up with it.

I don't think the perceived high prices of LSAs are an issue and, in any case, it's a pipe dream to believe the manufacturers are going to reduce them. At Sebring, I saw some sub-\$70,000 airframes and those companies have fewer orders than those selling models costing twice as much.

Conclusion: It will be a slow, long haul to LSA market growth. When it reaches 1200 to 1500 units a year in the U.S., call that boom times. —Paul Bertorelli



## In-the-Ear Headsets

I was interested to read your article on in-the-ear headsets in the February 2011 issue as I converted to an ITE system 3 1/2 years ago. I fly a turbonormalized Cirrus SR22. At Sun-n-Fun 2007 I bought both the Quiet Tech Halo and the Clarity Aloft with the intention of testing them to evaluate them against my Bose headsets. Going into my test I felt the Bose would be superior and the Clarity Aloft would beat the Halo, based on appearances.

I typically fly 200 to 275 hours a year and my flying consists of a mixture of short local flights and long cross country trips. On several occasions, I have flown long days back to back and I remember one trip when I flew out to Arizona to pick up my son and returned to my home base at Martha's Vineyard the next morning. That was four days of long legs and the Halo was as invisibly comfortable on the last leg as it was on the first.

Comparing the Halo to the Clarity Aloft, the Clarity Aloft seems more robust at first glance, but in real life, the Halo has been a stellar performer. The Halo system seems to fit against my neck more comfortably and when turning my head, the Halo doesn't catch against my collar or rub against the seat back. The long tubes are there for the user who wants to keep the Halo on their shoulders. Trimming the tubes is easy and there is no mystery to their official length.

The real test however is noise reduction and microphone performance. Here the Quiet Tech Halo was a standout. It offered noticeably better



performance than the Clarity Aloft in both areas. I remember the early testing I did and I was shocked to find that the sound quality and noise reduction was superior to my Bose headsets. I kept switching back and forth from the Bose to the Halo to confirm what I was hearing. One time, I caught the cord under my seat track and nicked the cord. I had to return the Halo for service. Returning to my Bose was like torture. The Halo was returned as new and quickly.

I now own four Halos and keep the Bose for those who want more traditional hearing protection. Even after the two-year warranty period has passed, Halo support has been perfect. Phil continues to stand behind the product fully, with customer satisfaction his primary concern. I wish other manufacturers would be half as keen to follow his example. As with other new things, the foam earpieces become second nature after a bit of use.

Myron Garfinkle  
via e-mail

## More on Sunglasses

For some time I've felt that the advantages to wearing vision enhancing sunglasses make them an essential safety tool, so when I saw your sunglasses review, I thought I was in for an education. Unfortunately, I found your review disappointing when it failed to educate your readers in at least two important topics.

Your review didn't separate sunglasses that filter all parts of the visual spectrum equally (known as neutral-density filtration, which are always grey lenses) from those that claim to enhance visual perception. The latter is often referred to as Blue-Blocking and are generally rose or yellow tinted.

While these claims of visual enhancement may seem like marketing hype, skiers and professional drivers



wouldn't be caught without them. In

daylight fog, snow, haze or other adverse conditions, the advantages are dramatic and easily measured.

Road signs that are featureless shapes become readable at far greater distances; cars that are invisible become distinct; terrain features are much easier to make out. In aviation, discerning light-colored aircraft from light-colored clouds and snow-covered terrain is at least as important. Please, at least test this out and report back to your readers. I'll be amazed if you find grey sunglasses and Blue-Blocking sunglasses to be equal.

The other topic of interest is segment height in progressive ground glasses. I suspect many of your readers, like myself, have decided to wear progressive eyewear. These are ground to allow reading through

*continued on page 32*

## CONTACT US

**Editorial Office**  
941-929-1693  
E-mail: [avconsumer@comcast.net](mailto:avconsumer@comcast.net)

**Subscription Department**  
P.O. Box 420235  
Palm Coast, FL 32142-0235  
800-829-9081

**Online Customer Service:**  
[www.aviationconsumer.com/cs](http://www.aviationconsumer.com/cs)

**Back Issues,  
Used Aircraft Guides:**  
203-857-3100  
E-mail: [customer\\_service@belvoir.com](mailto:customer_service@belvoir.com)

**For weekly aviation news updates, see [www.avweb.com](http://www.avweb.com)**



CubCrafters Sport Cub



Legend Cub



## Three Cubs: New LSAs vs. the J-3

*Other than being faster, safer, more comfortable and with a way better panel and engine than the J-3, Cubs from Legend and Cub Crafters are just like the original.*

by Paul Bertorelli

**T**his thought experiment is irresistible: What if the clock were wound back 50 years and William T. Piper got a look at the modern crop of light sport

### FLIGHT TRIALS

airplanes that bear the name of his beloved Cub? Would he be pleased? Our guess is that he would not be, although Walter Jamouneau would be. Jamouneau was the engineer responsible for improving the Taylor E-2 and evolving it, eventually, into the J-3.

It's not that Piper was a purist and would be offended by what the likes of Legend and Cub Crafters

have done to his classic everyman's airplane. It's because Piper was, above all else, a salesman and in his day, the \$1325 price was what would make the thing sell (and did) and thus become the iconic conception of light aircraft. The J-3 was not the perfect airplane. It was compromised to

*Cubs do asphalt, but they belong on grass. In addition to LSAs, Cub Crafters makes the Top Cub, right, essentially a modern Super Cub.*

be affordable, not be the best that could be built. Piper could not have imagined that seven decades later, his J-3s would still be competing with new airplanes as they most assuredly do. But the Legend Cub and Cub Crafters S2 Sport Cub are closer to what Piper might have wanted but wouldn't have built.

Both are less compromised purely for price and both represent the Cub idea executed as well as it can be. Despite the advent of LSA, the days of an airplane for every man are gone and neither the Legend nor the SportCub can pretend to be one, in our view. Of the two, the Legend is closer, given its lower cost. Although it hasn't ignited the market explosion many have hoped



J-3: WOOD  
LEGEND: WOOD, METAL,  
COMPOSITE  
SPORT CUB: WOOD, METAL,  
COMPOSITE

J-3: 22 FT. 3 IN.  
LEGEND: 22 FT. 5 IN.  
SPORT CUB: 23 FT. 4 IN.

J-3: 5 FT. 5 IN.  
LEGEND: 5 FT. 8 IN.  
SPORT CUB: 5 FT 7 IN

J-3: 65-HP CONT.  
LEGEND: 100-HP CONT. ; 120-HP JABIRU  
SPORT CUB: 100-HP CONT.

J-3: EXPANDER TUBE HEEL BRAKES  
LEGEND: GROVE DISC HEEL BRAKES  
SPORT CUB: GROVE DISC TOE BRAKES

J-3: IRISH LINEN  
LEGEND: POLY FIBER  
SPORT CUB: POLY FIBER

J-3: 8.00 X 4.0  
LEGEND: 8.00 X 6, 26-IN. TUNDRA  
SPORT CUB: 8.00 X 6, 26-IN, 39-in TUNDRA

J-3: 35 FT. 3 IN.  
LEGEND: 35 FT. 6 IN.  
SPORT CUB: 34 FT 3 IN

J-3: 24.5 IN.  
LEGEND: 28.5 IN  
SPORT CUB: 28.5

Drawing courtesy  
www.schemedesigners.com

	J-3	LEGEND	SPORT CUB
NEW PRICE	\$1325	\$113,895 (BASE)	\$139,950 (BASE)
TYPICAL USED PRICE	\$28,000 TO \$35,000	\$68,000 TO \$118,000	\$99,500 TO \$127,500
USEFUL LOAD	470 LBS	480 LBS	488 LBS
FUEL CAPACITY	12 GAL	20 GAL	24 GAL
CRUISE SPEED	65 MPH	90 TO 115 MPH	90 TO 115 MPH
RATE OF CLIMB	300 FPM	700-900 FPM FPM	700 TO 800 FPM

for, the light sport rule has focused attention on new airplanes that cost less than half of what new conventional aircraft do.

Further, because no medical is required to fly light sport, many certificated pilots who can't hold a medical are staying in the game and others who wouldn't have otherwise considered owning an airplane are kicking tires. And some of those are the 8.00 X 4s on J-3s, other legacy light sport options and new LSA models from more than a dozen manufacturers. The fact that one in six LSAs sold is a Cub-type taildragger illustrates the enduring appeal of Piper's design.

But do 60- or 70-year-old J-3 Cubs really compete with new Legends and Sport Cubs? To a degree, we think they do and for at least some buyers, the competition is direct. Buyers shopping LSAs who are put off by prices north of \$120,000, often seek refuge in the legacy list. This will inevitably lead them to J-3s.

As legacy aircraft go, the words "cheap" and "Cub," don't belong in the same sentence. Cubs have evolved to cult status and are priced accordingly. An early J-3 with a premium restoration job might command as much as \$40,000, although realistically, \$25,000 to \$35,000 is more likely.

are sometimes listed in the high teens and low 20s, although these prices have escalated recently. Any legacy LSA you'd be willing to fly will, realistically, cost at least \$20,000.

The Legend and Cub Crafters Sport Cub sell for multiples of that number. The base price on the Continental O-200-D-powered Legend is \$113,895 and tricked out with typical avionics, the invoice will come to \$120,000. A float model (see April 2010 *Aviation Consumer*) will cost as much as \$159,000.

The Cub Crafters Sport Cub occupies near the top tier for LSAs, at a base price of \$134,950 for a Continental-powered airplane, plus another \$10,500 for a basic VFR panel

*Legend, near photo, stuck with a conventionally hinged elevator while Cub Crafters' S2 has a counterweight design. Both use the jackscrew trim method found in the J-3, inset.*

Aeronca Champs, by comparison,

(Garmin aera 550 GPS, navcom and transponder) and \$19,900 for a max panel, with a Garmin GDU 370 and a Dynon D180.

## BASIC AIRFRAMES

Doing the simple math here, adjusting for inflation, the new Cubs are six to seven times the cost of the original Cub and a multiple of four to five over a restored legacy model. What justifies this? Nearly everything, in our view. Other than being yellow—and maybe not even that since you can customize the color scheme—these airplanes are barely in the same universe as the J-3. As a point of reference, the





*A J-3's panel, top, is 1930s minimalist. But for both the Legend, (center) and the Sport Cub, avionics choices are considerable, ranging from Garmin portables to Dynon's top-of-the-line EFIS units. The Sport Cub's design (lower) tends toward the more colorful and stylish.*

more apt comparison might be to the Super Cub, since these new airplanes are closer to that paradigm. But Super Cubs don't qualify for LSA; the J-3 does. There is a philosophical point of departure between Legend and Cub Crafters. Legend has exercised more

restraint in hewing to the original Cub while improving it at every turn. Cub Crafters' approach is more conceptual; it has all but retooled the Cub idea from the ground up.

Both airplanes have the same welded tubular steel frame that Piper used, although the dimensions and construction have more in common with the Super Cub than the J-3. Legend beefed up the overhead structure in the cabin to improve crashworthiness and where Piper gas welded the frame, Legend TIG welds parts that are cut via CNC milling to improve precision. Cub Crafters uses MIG welding. Cub Crafters also points out that its higher price is due in part to adhering to Part 23 standards rather than ASTM standards. On the other hand, LSA standards went the ASTM route to provide less expensive airplanes.

Cub Crafters has made more extensive changes to the basic frame, including re-jiggering the aft longe-

ron and reducing the overall frame parts count to simplify construction. Both the Legend and Sport Cub have improved corrosion proofing and gone is the Cub's spruce spar, replaced by aluminum.

Modern designers would gasp at the original Cub's inclusion of the gas tank inside the passenger cabin, so as a safety factor, both new Cubs have the tanks in the wing roots and both carry more fuel than the J-3—24 gallons usable in the Sport Cub, 20 in the Legend.

Where the old Cub had a coat-hanger wire on a cork for a gas gauge, the new ones have sight gauges in the wing roots. The fuel system is left/right/both in both the new Cubs. It's on or off in the old one.

With its closer adherence to the original, the Legend has the same tail-feathers as the J-3 and also the same landing gear dimensions, but in place of the Piper's bungees, Legend has a pair of beefy die springs instead.

These soak up the bounces better and require less maintenance. Legend also stuck with Piper's original jackscrew trim system, but doubled up the cordage to prevent slipping so it works well against air loads. Legend parted company with Piper on the brakes; rather than the old expander tubes, it has Grove disc-type brakes, although in a bow to the original, they're activated by heel rather than toe pedals.

Cub Crafters took a different tack. It modified the elevator to include a more modern counterweight design and although it has the jackscrew, the Sport Cub has electrically activated trim only. The gear is similar in concept but has a step welded to the front gear leg to help ingress. (The Legend does, too.) Cub Crafters uses Grove brakes, too, but with toe pedals rather than the Legend's heel brakes.

Like the Super Cub, but unlike the Legend, the Sport Cub has flaps—big ones. They're manually operated by a

## CONTACTS

Cub Crafters Inc.  
509-248-9491  
[www.cubcrafters.com](http://www.cubcrafters.com)

American Legend Aircraft Co.  
903-885-7000  
[www.legend.aero](http://www.legend.aero)

## AC TV



For a video demonstration of all three Cubs, log onto [www.avweb.com](http://www.avweb.com) and click the video index in the upper right home page, then scroll down to the Three Cubs video.

ratcheting lever mounted to the wing root on the pilot's left side.

Also noticeable—and in keeping with its cutting-edge ethos—is Cub Crafters' use of carbon fiber throughout the Sport Cub, molded with a vacuum bagging method. The cowling, interior panels, the cabin floor and other components are carbon fiber, a light and durable solution.

## SYSTEMS, ENGINE

To apply the word systems to the J-3 is to overstate the case. If a valve and a bit of tubing is a system, well, ok. The original Cub is tractor-like in its design, with everything made as close to the earth—or shop floor—as possible. Both the Legend and Sport Cub are more sophisticated, obviously.

First, electric systems and starters. Both the Legend and Sport Cub have giant 40-amp alternators to run the electrics and charge a small starting battery. While we like charm as much as the next guy, it wears thin while hand propping a J-3 through the 30th blade on a warm day. Given the choice, we'll take the starter.

Some J-3s have slipstream generators, but we haven't seen many, so if an electrical system is a must, a newer LSA might be the better choice. Further, an electrical system begets radios and transponders, which opens up airspace not available in non-electrical system J-3s with a portable radio.

Perusing the optional equipment list for both the Legend and the Sport Cub, Bill Piper might just be convinced to roll over on his unwavering devotion to cheap. Both companies offer generous choices for panels, ranging from a basic Garmin aera to the top-of-the-line Dynon and Garmin 696 if you're so inclined. The fact that some of these devices are primarily battery powered is a nice plus for backup, in our view.

Both the Legend and Sport Cub are somewhat unique for having Continental O-200s in a segment dominated by the Rotax 912ULS. While the Rotax is undeniably a more modern engine and has features we like—electronic ignition, mainly—the O-200 is no slouch. We think its



## HOW 'BOUT THE CARBON CUB?

If the Sport Cub is the J-3 (or Super Cub) writ without compromise, the Carbon Cub is the same airplane writ completely around the bend. Cub Crafters made a ripple when it introduced this airplane in 2009. The company enjoys taking the airplane to Alaska and embarrassing Super Cub drivers by pulling the Carbon Cub off the ground in less than its own length.

This is made possible by the 180-HP CC340 which is, as far as we know, the first purely ASTM-approved engine. Its basis is the OX-340 Stroker ECI developed for the experimental market, an engine that's in turn loosely based on the Lycoming O-320.

From the firewall aft, the Carbon Cub is essentially the same as the Sport Cub. The empty weight of the Carbon we flew was 895 pounds compared to 886 pounds for the S2. While the S2 had 26-inch tundra tires, the Carbon had 8.60 X 6s. Despite the additional drag, these don't impact performance much, but the big wheels soak up bounces and make an average tail-dragger pilot look like an expert.

But takeoffs are what the Carbon Cub excels at and, as expected,

with all that thrust, the airplane bolts into the air in dozens, not hundreds of feet. At a 50-MPH indicated speed, the deck angle and climb rate are stupid high. (We saw a 1500 FPM initial rate.)

But Cub is another word for drag, so the airplane's cruise is Super Cub-like. At 4000 feet, we estimated a 114 MPH true airspeed on about 8.5 GPH. Throttling back to a quieter 2000 RPM yields a bit less than 100 MPH on 4 to 5 gallons.

Compared to the S2, the Carbon Cub climbs better, and cruises a little faster, but it's also kind of brutish. The noise level is higher by a couple of dB and it's more vibey than the Continental-powered S2. Apart from the blistering climb and STOL capability, it flies like the S2.

Does it belong in this comparison? It is a Cub and it is an LSA. But it's also out on the alien edge of what this market segment is likely to be. The base price is \$163,280 and typically equipped, it would be closer to \$180,000. Frankly, given what the thing is capable of and its ramp appeal, we don't think that price is out of line for an airplane that's at the opposite end of the universe from Bill Piper's original cheap airplane idea. Lacking a better description, it's really a custom hotrod and hotrods don't come cheap. For a complete review, see the June 2009 issue of *Aviation Consumer*.

more conventional, smoother throttle response makes it more flyable than the Rotax. Cub Crafters offers the O-200-A, while Legend has the O-200-D lightened version. Even with metal or composite props, we found both of these to be exceptionally smooth runners.

## FLYING THEM

Yes, the new-age Cubs depart substantially from the original in design and construction, but do they fly the same? No, they don't. Not quite night and day, but maybe dusk to noon.

First, egress and creature comfort. With its larger wheels, the Sport Cub

is higher than the J-3, but easier to get into, thanks to the step and higher seats. And, oh, those seats, especially the front. Both the Legend and Sport Cub can be soloed from either seat and this is a huge plus. The front seat in a J-3 is a rack, with little leg room, the gas tank banging against your knees and no hope of improving the seating position.

Also, the cabins in both the new Cubs are four inches wider than the J-3 and it might as well be four feet given the improved comfort. Further, both of the new Cubs have a proper baggage compartment, not the canvas breadbox found in the original. Solo-

ing from the backseat of a J-3 is like being in a hole, so S-turns during taxi are a must. Not so flying from the front seat of the Legend or S2. You can just see over the top of the cowl and/or peek around the glareshield during taxi, a huge improvement over the J-3. Taxi turns in both the new airplanes are tight and precise, thanks to good brakes, compared to slightly sloppy in the J-3.

While a C-90-powered J-3 would compare more favorably to the Legend and S2, a C-65 doesn't. The additional 35 horsepower in the new airplanes make for a spirited hop off the runway and enough climb rate to actually reach pattern altitude by mid-downwind. In a J-3, you wouldn't bother trying. We did notice that our C-65 J-3 requires less effort to raise the tail, but we flew with a passenger in the rear, which may account for that.

Handling wise, the new Cubs have the same pronounced adverse yaw as the original, so they require deft footwork to keep the ball centered. Both the S2 and Legend feel more precise than our old J-3, probably because they're new and tightly rigged. We found that the Sport Cub's perceived roll forces were higher than either the J-3 or the Legend and because the stick is shorter, it's not quite as comfortable to rest a wrist on a knee while flying. If we had a choice, we would prefer a stick two inches longer. Cub Crafters has heard the complaint and is considering a longer stick.

Cockpit visibility from the front of the S2 is excellent, almost like sitting in a fishbowl and better than the J-3. Legend offers two cowl types, a traditional design with the cylinders exposed and a Super Cub-type pressure cowl. Legend's Darin Hart told us the pressure cowl design opens up the forward view even more.

The S2 and Legend cruise fast enough to actually go somewhere. We saw about 94 MPH indicated in the S2 at high cruise, burning about 5 to 6 gallons. At 2000 RPM and 4 GPH, we saw about 80 MPH indicated. By comparison, our C-65 J-3 dawdles along at 65 to 70 MPH indicated.

The Legend did a little better, probably due to its ground adjustable prop, also an option on the Sport Cub. We recorded 98 MPH indicated, again on a little more than 5 GPH. But the reality is both airplanes cruise at the same speeds. Both of the Legend's doors

open and the windows have blast vents, so cabin comfort is excellent. The S2 has a single door, but has vents in the overhead skylight.

## CONCLUSION

In our view, these two aircraft are among the top quality offerings on the LSA market. Not for nothing has the Cub idea endured and it's not all nostalgia—these airplanes are both fun and challenging to fly, with none of the quirks of other light sports we've tried. Build quality on both is top drawer, especially Cub Crafter's incorporation of carbon fiber. The work is flawless.

Which to choose and why choose one over the original J-3, of which there are many available? The main driver is money, we suspect, given the aforementioned price multiple. Second, if you really want to go anywhere, 65 MPH won't cut it unless you have absolutely no time schedule. Another 30 MPH makes an impossible trip doable.

Between the S2 and the Legend, the two are nearly equal in performance and capability, in our view. The S2's flaps give it a little edge in short field work. On the other hand, the Legend has lighter control forces. They are not equal in price, however. The S2 carries a 23 percent premium over the Legend. What you get for that is some nicer build details, such as milled aluminum fittings where the Legend has steel, beefy rods to interconnect the pedals while the Legend uses traditional cables, the aforementioned flaps and other nice-to-haves, including a convertible rear seat for cargo carrying.

For the traditionalist who wants a safer, faster, updated Cub, the Legend is the value leader, in our view. If budget is less of an issue and you can afford a polished jewel with exceptional detailing, the S2's features make for an uncompromised product for those who prefer the newest technology applied to an old idea. We would be happy with either, frankly.

## AIRCRAFT INSURANCE

# Still a Soft Market But Not For Long

*A glut of new entrants following 9/11 softened the market, but flagging profits and a large hangar collapse may spark a gradual rise in premiums.*

by Jon Doolittle

Insurance rates for most general aviation aircraft are lower than they have been in many years and some industry insiders believe that we are on the brink of a sea change. Even in this wildly cyclical business, old timers agree that this "soft" market is the deepest and longest lasting that they've ever seen. With prices as low as they are, this is a challenging time for underwriters. Predictions about where the market will go, how far and how quickly run the gamut.

Following the 9/11 attacks, rates for many airplanes, especially corporate airplanes, virtually doubled over-

night. As a result, aircraft insurance was quite profitable for several years. This profitability did not go unnoticed and within three years, new entrants began to enter the business.

By 2006, there were seven more companies insuring aircraft than there had been in 2002. Some of the new entrants were established airline and aerospace insurers seeking a presence in general aviation in the U.S., but some were new to aviation. Recently, rumors have begun to circulate of yet two more possible start-ups. The new companies offered low premiums to get new customers

and the old companies were forced to offer low premiums to hold on to their old ones. The financial collapse in 2008 came at a time when many thought that prices would begin to increase, but GA suddenly seemed fragile. Rates continued to fall.

## ECONOMIC CYCLE

Insurance price cycles are more the product of economic conditions than of minute changes in accident rates from year to year. Insurance market swings are not a new thing, but this one is something of an anomaly. Typical soft markets take place in times of economic prosperity when there's considerable opportunity for insurers to invest money for the time between when they collect premium and the time that they have to pay it out in claims.

Insurers will offer great premiums deals in order to put money in the bank and invest it. This allows them to suffer slight underwriting losses but still remain profitable because of the investment income. The current soft market began in a time of prosperity, but has lasted and deepened through two more years when investment opportunities have become rare.

The explanation may simply be one of supply and demand. In order to sell insurance, companies must bank cash in the form of reserves and surplus to make certain that they can meet the obligations of the policies that they have written. The capital required to back insurance policies is known as capacity. With all of the new companies that have flocked to general aviation, there is considerably more capacity available than is needed.

In addition to downward pressure on premiums, soft markets are also characterized by the easing of underwriting guidelines. Companies may offer higher limits of liability, insure types of airplanes that they didn't before, relax training requirements or add new coverages to their policies, all in order to attract new customers and hang on to existing ones.

The benefit of the current low rates has not been evenly shared across the GA community. Big-ticket, pro-flown corporate airplanes have had the largest reductions. These are also the airplanes that saw the largest increases after 9/11. According to brokers

and underwriters that we spoke to, many corporate insurance premiums have dropped to one-third of what they were in 2002. Beginning in 2004, many of these airplanes were forced to purchase higher liability and war risk limits to fly in EU airspace, so the drop is even larger than it looks.

Owner-flown turbine airplanes and helicopters have seen rates decrease substantially, although not on the scale of big-iron corporates. Light airplanes were very little affected by the big increases in 2002, but many of them have seen their prices come down significantly.

Despite the perceived reduction in flying activity during the past two years, underwriters unanimously agreed that their loss costs had remained fairly constant. Two senior officers told us that the cost of both hull and liability claims has been increasing at around 10 percent each year. Most agreed that airplanes were getting more expensive to fix and that liability settlements continued to creep up.

Finally, several underwriters singled out unprecedented reductions in aircraft values in recent years as a factor in the difficult environment they face. Since most of the physical damage losses that they pay are partial losses, they are receiving substantially lower premiums in return for only a small reduction in payouts.

There have been rumblings about rates going up for over a year, first in the airline market and increasingly in general aviation. Insurance companies purchase insurance on their own claims, much of it to protect them from unpredictable catastrophic losses. Reinsurers have threatened to charge primary aviation insurers higher rates for this coverage for several years now and a number of carriers told us that their rates had increased substantially at their last renewal.

Curiously, insurers and reinsurers



*Premiums for bizjets like the Gulfstream 550, top, have been at all-time lows but are almost certain to rise. Owners of light aircraft such as the SR22 may be less affected, but could still see modest increases.*

seem to take turns accusing each other of failing to maintain rates at levels adequate to pay claims and provide a reasonable profit. The old line insurers blame reinsurers for making inexpensive reinsurance available to the newer companies, who then make use of the reinsurance to issue policies at below market rates, which the old line companies are forced to match to keep their customers.

Frequently a catastrophic event will be the catalyst that starts an insurance market hardening. If big enough, one of these events can change the entire industry outlook from marginally profitable to completely unprofitable. On February 6, 2010, Dulles Jet Center suffered the collapse of three of its four hangars and considerable damage to the fourth under the weight of almost two feet of snow. The collapse damaged or destroyed a number of large airplanes, and may be the largest

## DISASTROUS HANGAR COLLAPSE

At about 8 a.m. on the morning of February 6, 2010, Hangar A of the Dulles Jet Center collapsed under the weight of heavy, wet snow. Throughout the rest of the day, two of the company's other hangars collapsed, the last suffering significant damage.

Built a scant four years before, each of the four hangars had 40,000 square feet of space and all were packed with expensive corporate airplanes. Hilton Hotels, Nextel, Computer Sciences and Kodak all had airplanes stored at the facility. In all, 19 airplanes were in the four hangars at the time of the collapse.

The fourth was occupied by General Dynamics, which removed its airplanes despite significant damage to the building. The remaining airplanes were pinned under the collapsed roof with varying degrees of damage. Structural engineers began to examine the building and to devise a plan to deconstruct the fallen hangars while minimizing further damage to the fragile airplanes pinned to the floor.

On February 16, aircraft owners and their insurers were contacted by an attorney representing DJC inviting them to inspect their aircraft. Owing to the precarious state of the buildings, each person was closely escorted and each was required to sign a waiver acknowledging and assuming the risk.

Work was begun bracing the hangar parts that were still standing, as well as the removal of debris. On March 19, aircraft owners and insurers received a letter from David Landow of DJC, informing them that his bank was holding up insurance payments to the contractor for debris removal. Shortly afterwards, the contractors packed up and left.

There followed two weeks of conversations between insurers. Clearly, the aircraft insurers were left to their own devices if they wanted their clients' airplanes back. The 15 airplanes trapped were insured by four companies and

no one wanted to make the first move. Any single company attempting to get its airplanes out was likely to become liable for damage to the others.

In early April, a senior claims officer at USAIG came up with a legal structure for the removal of the airplanes. He formed Recovery LLC solely for the purpose of funding the work. USAIG and Chartis were the first contributors to Recovery LLC, which ultimately included all of the companies but one. DJC chose a contractor for the work, and Recovery paid the contractor as the work went along.

The work began in May and by the end of June, they had freed the first airplane. By late August, the last airplane was recovered, seven months after the collapse.

Six airplanes were destroyed or damaged beyond economic repair. Most of the others suffered some damage. All were rendered unusable for five to six months. Lawsuits will almost certainly go on for years. One question will be whether Dulles Jet Center was legally liable for the collapse, or if the unusually heavy snow will be viewed as an act of God.

There will also be questions about the design and construction of the building. Most of the payments so far have been made by hull insurers of the affected airplanes. If either Dulles Jet Center, its builder, architect or engineers are found to have been negligent, liability insurers will be faced with claims for the losses, as well as loss of use claims, and loss of value claims for the airplanes that were repaired.



results are spurring reinsurers to increase the rates which they charge primary insurers. Several company representatives told us they would have to pass their higher reinsurance costs on to their customers. Reinsurance programs vary widely from one aviation insurer to the next, but most catastrophic protection starts well above levels used to insure light airplanes. We don't see much radical change taking place unless the amount of available capacity is

reduced. Faced with bad enough results, insurers could withdraw and put their capital to work elsewhere, as Travelers did two years ago. But we don't see any of the companies in the business now who seem likely to abandon it any time soon. This, taken

together with persistent rumors of at least one more new entrant, we don't see much chance of capacity being reduced in the near future. We believe that rates for most owner-flown airplanes are historically low and that they will start to increase at some point, but we don't think it will take place in the next year. We also think that when it starts, it will be gradual.

Whether or not the Dulles Jet Center collapse will spark the next hard aviation insurance market remains to be seen. We think it will, but we don't see the kind of rapid hardening that has sometimes happened in the past.

From what insurers are saying, it seems likely to us that rates for corporate airplanes and other sectors will begin to rise in the near future, but at a modest pace. The increases that reinsurers are seeking do not seem to us as if they will have an immediate effect upon light airplanes or even on light jets, whose relatively modest hull values and limits of liability put most of them below the levels of most excess of loss reinsurance programs.

---

*Jon Doolittle owns and operates Sutton James Incorporated, an aviation insurance brokerage in Hartford, Connecticut. See [www.suttonjames.com](http://www.suttonjames.com).*

single property damage occurrence in the history of general aviation.

Estimates of its ultimate size vary, but most people seem to think it will be over \$200 million before the last lawsuit is settled. Worldwide general

aviation premium is loosely reckoned between \$1.5 and \$2 billion, so this one claim will eat up more than 10 percent of the total. (See sidebar above.)

This event and years of lackluster

# External Power: Starting Amps a Plus

*Ground power units are a must for doing avionics ground training. But only Enhanced Flight's GPU also provides starting amps.*

**W**hen gas was cheap(er), no one thought about doing avionics training on the ground. After all, how long does it take to learn to tune a radio and center a needle? Glass panels changed that. Now, even if you have a sim program, you still have to seal the deal with some seat time in the airplane.

That's best done on the ground, preferably with the engine off and that's where a ground power unit comes in. Not many owner hangars have these valuable gadgets, but a new offering from Audio Authority, the 2860A GPU, might provide a reason to buy one. With 60 amps of output, the Enhanced Flight GPU is the only small product of its kind to provide start assist capability.

## HEAVY DUTY

This GPU is designed and constructed more or less like an audio rack component because that's where it comes from. The product is built by Audio Authority, which actually specializes in audio display components for retail stores but whose owner, Jonathan Sisk, has been active in developing STCs for the Piper Mirage.

The 2860A GPU is small for its output, measuring 7.2 by 14.6 by 13.7 inches with a weight of 23.8 pounds. It's easily carryable in a baggage compartment, if necessary. It's equipped

with a long cable which, conveniently, can unplug from the unit itself, making it easier to carry and stow. Two robust marine-type plastic cleats serve as cable stows on either side of the GPU. The front panel is equipped with a digital volt and ammeter display and is overload protected. For flexibility, there are plastic feet on both the bottom and back of the GPU.

With its high output, this GPU is suitable for starting an aircraft with a low but not necessarily flat battery. The company says to serve as external power, the ship's battery should show at least 22 volts. (The GPS is 28 volts only.)

Although the GPU will top up a battery, it has no cutoff or charging circuitry, so it's not specifically a battery charger. If we have any wants, we would say it's dual voltage. Although we can't think of many (if any) glass

airplanes still running 12-volt systems, having this as an option is desirable, especially if the device is used by an FBO, a club or owner group with a mixed fleet. A dual cable option would also be a plus.

At \$1095 complete, the GPU is a good value against the popular Red Baron APU at \$675. Although the Red Baron is dual voltage and can be equipped with dual cabling for the Piper-type plug, it lacks start assist capability which, sooner later, everyone seems to need.

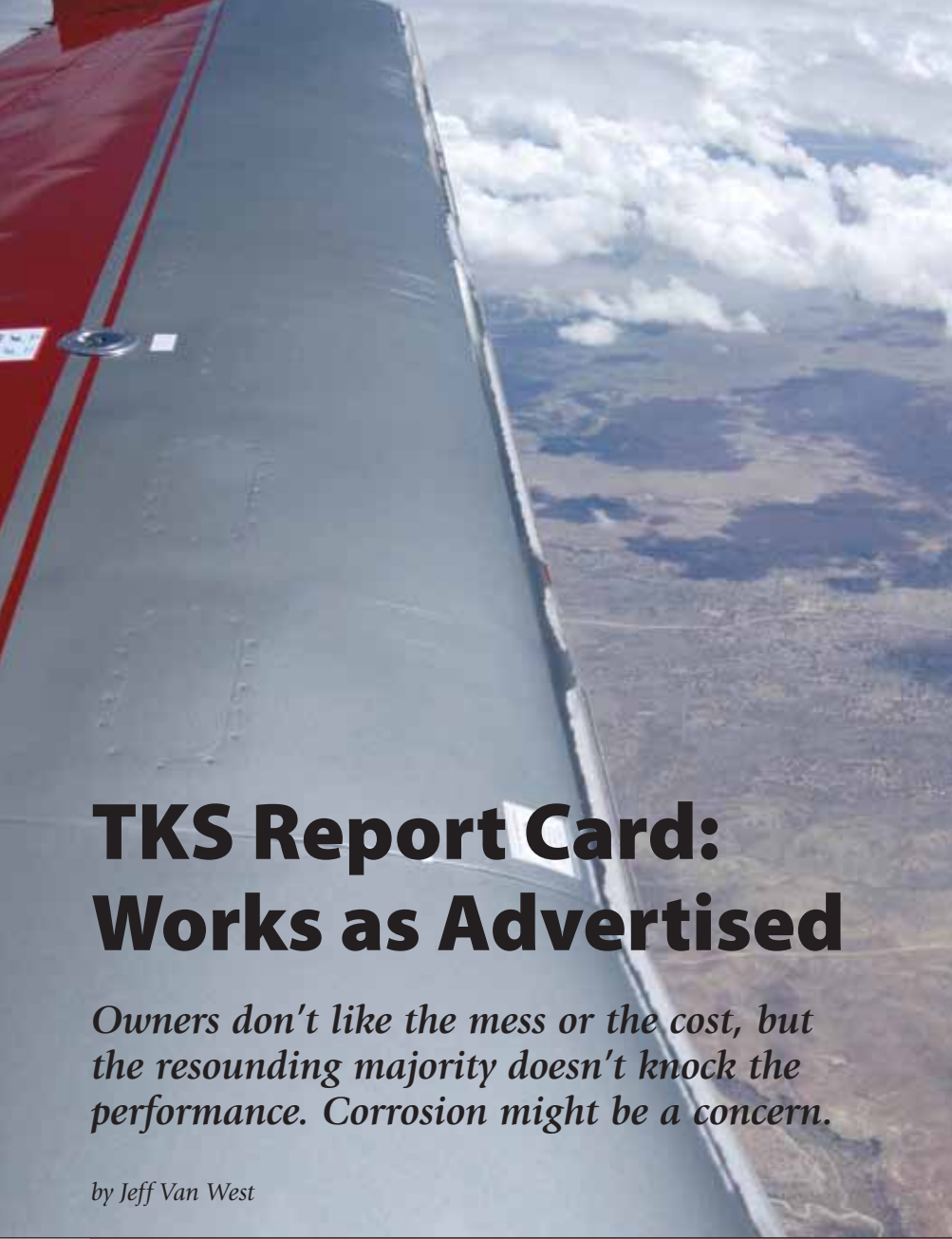
## CONTACT

Audio Authority Corp.  
800-322-8346  
[www.audioauthority.com](http://www.audioauthority.com)

Sporty's Pilot Shop  
800-776-7897  
[www.sportys.com](http://www.sportys.com)



*The GPU 2860A has digital volt and ammeter monitoring. A dual cable with the Piper-type plug would be a nice addition, as provided by the Red Baron, inset.*



# TKS Report Card: Works as Advertised

*Owners don't like the mess or the cost, but the resounding majority doesn't knock the performance. Corrosion might be a concern.*

by Jeff Van West

## FIELD REPORT

**W**hile your number one tools for navigating icing conditions are gray matter and a good mental map of the weather, deicing equipment opens up a world of options. Flights that would be preemptively cancelled can be attempted and situations that would be emergencies turn into calm requests for a new altitude.





Deicing options are largely set by the airframe, with only a few models having certification for both boots and the TKS weeping wing. In November 2008, we picked TKS as the better choice. We still think so, and in our recent survey, most owners agree. While not without drawbacks, most pilots are happy with the system and accept its tradeoffs.

We heard primarily from Cirrus and Mooney owners, but also from pilots of Hawker jets, Cessna 210s and even a de Havilland Dove. Most fly well in excess of 100 hours a year. About half bought a plane with TKS already installed and for many that was a selling feature.

### WHY FLY TKS?

The primary motivation for pilots purchasing planes with TKS or adding it is dispatch reliability. One pilot gave us his math: "For about 15 percent of the value of the airframe, I was able to take an aircraft that had transportation utility for eight months a year and turn it into a 12-month aircraft—an increase of 50 percent in utility." Another pilot put

## CHECKLIST

-  All systems keep wings and tail mostly ice free in light to moderate icing.
-  Certified systems offer backup pumps, more fluid and piece of mind.
-  The fluid is expensive, toxic, and drips after use.
-  The fluid eats useful load, especially when carrying extra for the trip home.

*This Mooney left the factory with blocked panels, but it can look the same if the system isn't run at least monthly, and kept free of grime and wax. (Photo: Michael Christie)*

a regional twist on this: "In the New York City vicinity, where I fly, GA aircraft don't get to choose altitudes. That severely limits the utility of the airplane when icing is an issue."

These comments outweighed ones about getting out of inadvertent icing conditions by a respectable margin (although ice scares were dealmakers for some pilots). The bottom line was that pilots with TKS are confident launching knowing they may encounter ice before the wheels touch back down. How much icing and under what circumstances pilots were up for varied quite a bit. Hold that thought for a moment.

We also heard from two pilots who installed TKS after hail damage in flight. No, the TKS wasn't to prevent against future hail. The TKS install was covered by insurance rather than just repair the leading edge. Not that we'd recommend seeking out a hailstorm to score a discount TKS system. Some other pilots had pneumatic boots that needed replacement and chose to switch to TKS for a small cost delta.

### IT WORKS, MOSTLY

Pilots with experience using boots told us the system was equal to or better than boots. "I fly across the Great Lakes regularly in the winter and the piece of mind is priceless. The system works much better than

boots on my twins." Another told us: "I became a believer after flying Commanders for Central Air Southwest. I landed at Cincinnati one night behind a King Air who had an inch or more of ridge ice behind the boots, and my wings were slick as slime with TKS."

Pilots with turbine time and hot wing experience were split. Some felt TKS was acceptable in jets. Others did not: "In flying the Hawker 700, 800 and 800XP for over seven years, the system is minimally protective at best. If priming is completed every 60 minutes (when temps permit) then, and only then, will the system work 40 percent as advertised. It will never maintain a clean leading edge." Other Hawker pilots pointed out how critical flying the published speed was with TKS running.

Sifting through the comments, it seems clear the system works best for the under-200-knot crowd and in light icing. Pilots told us that in moderate icing or freezing rain, the wings often carry slushy areas or spots of ice that may or may not pop off in flight. However, the airplane keeps flying with only a small apparent hit to performance. Icing can definitely get beyond the capability of the TKS, but with fluid flowing, there is time to make an immediate move to get out.

We looked specifically at how well TKS protected specific areas, but saw no red flags by area or airframe. Non-FIKI Cirrus pilots reported issues with wingtips and elevator balance horns at a higher percentage than average across all respondents. But that's no surprise as those parts

are unprotected. Systems on the Cessna 210, Mooney and Diamond DA42 scored above average on effectiveness, both FIKI and non-FIKI.

One advantage of TKS is that in systems with TKS to the propeller(s), fluid gets sprayed over many unprotected areas of the airframe, such as antennas or engine cowls, reducing buildup if not eliminating it. Wingtips still build ice on all airframes.

The number one operational takeaway from our survey was that TKS must be running for five to 10 minutes before encountering the ice. This is actually required per the POH for certified systems. Depending on your system, that could use half a gallon of fluid at \$20-\$40/gallon only to enter a cloud and find it wasn't needed. But as one owner put it, "that's the price of peace of mind."

*Upper left, clockwise: Ice on the unprotected balance horn of a non-FIKI Cirrus SR22 after a normal approach in icing conditions. Wiping off snow that fell during the night shows ice from an approach still on the tailplane leading edge of a FIKI Cirrus (Photo: Bill Straw). Ice on unprotected areas of a FIKI Diamond DA-42 (Photo: Robert Boyle) and Bonanza. This can add significant weight. The Bonanza was doing TKS certification flights.*





*That's ice on the wing of this FIKI Cirrus after landing. Moderate icing may not entirely clear. (Photo: Bill Straw)*

If ice builds before the fluid flows, it might not come off at all. TKS is best thought of as anti-ice, not de-ice.

The wise advice was not to count on a low (normal) setting keeping off the ice. Non-certified systems often only carry a few gallons of fluid. A non-FIKI Cirrus SR22 might only have 30 minutes of protection at the high setting. Yet few pilots reported ever having run out of fluid in flight, as it's most often used for a climb or descent through icing. Those that did run out got caught unexpectedly lin-

*We heard some reports of corrosion, including this Mooney. Poor installations or repaint jobs may be the culprit. (Photos: Bergstrom Lennart)*



gering in holds or on long vectors for an approach.

### **THOUGHTS ON FIKI**

The fact that TKS comes in FIKI and non-FIKI flavors has incited endless debates as to how much certification matters, and if non-FIKI systems motivate pilots to take on conditions they shouldn't. Surveyed pilots were split. About half the pilots had FIKI systems and half didn't. About half felt that FIKI was essential for anything beyond emergency use.

Pilots who felt FIKI was a nice ticket-protecting CYA, or simply didn't care about certification so long as it kept ice off, were num-

bered about 26 percent across the board, but numbered more like 50 percent if you just look at non-FIKI aircraft owners. Given that a FIKI system is \$10,000 - \$15,000 more for a given airframe, this makes sense: Those who don't care buy only what they feel they need.

That leaves 24 percent who say the FIKI answer is not that simple, and we agree. The physical difference between FIKI and non-FIKI on some airframes may be as slight as an ice light and a backup fluid pump. But a single pump is a still a point failure if you're regularly flying in icing. The difference could also be much wider airframe protection, more fluid capacity and a cockpit display of the TKS fluid level.

We saw multiple comments similar to this non-FIKI Cirrus pilot: "A winter day with

ground temp +2 degrees C, solid overcast at 2000 with tops reported as 5000, clear above. I will often launch into that. If ice is worse or accumulates even with TKS, my out is to RTB where it's above freezing. Would I do that without TKS? Probably not ... I think TKS is a great system. I just wish I could buy a FIKI Cirrus to enjoy the even better protection that offers. But, like anything, we need to use our minds and think through each circumstance."

### **TKS DRAWBACKS**

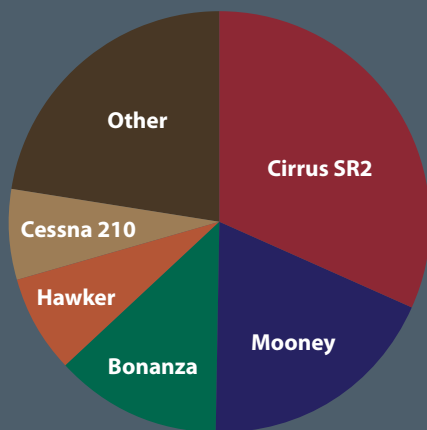
The system isn't cheap. On a new Cirrus SR22, the non-FIKI TKS option adds \$20,000. The FIKI system adds \$40,000. Retrofits costs are similar, ranging from the mid-20s to the mid-40s for piston singles. Note that retrofits often have additional modification costs, so every job is a custom quote. Expect to lose between 40-50 pounds of useful load just for the hardware. Costs and weight go up slightly for twins.

TKS fluid is a consumable. Just like gas, it eats into useful load and you can run out. The fluid weighs nine pounds per gallon. Looking at the Mooney system, that's 54 pounds of fluid if the tank is full. You need to keep some fluid in the system even in the summer to run it monthly—required to keep the pads wet and the pores open. You may also need to take extra fluid in jugs with you on trips.

Few FBOs stock TKS fluid, and those that do may charge upwards of \$50/gallon for it. You can find it online for \$20/gallon or less, including shipping. The best prices we saw were from Skygeek ([www.skygeek.com](http://www.skygeek.com)) or directly from Kilfrost ([www.kilfrost.com](http://www.kilfrost.com)). Be aware that there's a



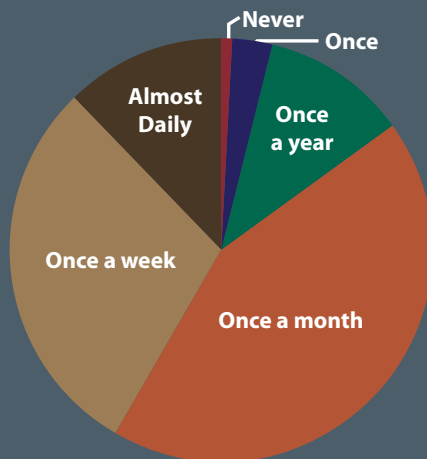
## WHICH TKS-EQUIPPED AIRCRAFT DO YOU FLY?



Over 50 percent of our survey respondents were Cirrus or Mooney pilots, although about 10 percent were Hawker or Citation jet pilots. In general, the piston pilots were more positive about the system than turbine pilots, especially those with hot-wing experience.

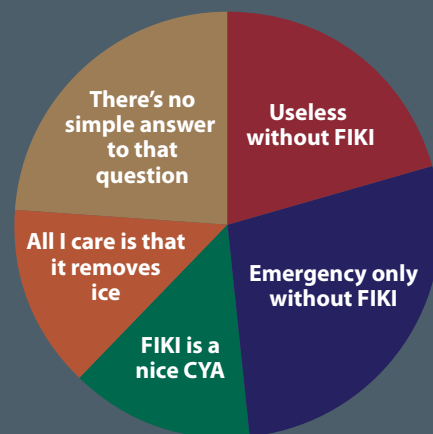
Across the board, pilots report that having any TKS system gives them the confidence to attempt many flights they would otherwise cancel, and agreed the system was best used to buy time for finding a way out of the icing, rather than trolling along in it (sound thinking with any de-ice/anti-ice system).

## HOW OFTEN DO YOU USE TKS DURING THE ICING SEASON?



Pilots who had FIKI systems generally felt the certification was more important than pilots who didn't. For example, just looking at non-FIKI SR22 pilots, 56 percent considered FIKI mostly a CYA or unimportant. Several of those flew in icing conditions weekly or daily. Pilots experienced with both generally agreed with this Cirrus pilot, "I fly FIKI and non-FIKI TKS on Cirrus aircraft. Non-FIKI is great for a shallow icing layer or on approach with several minutes in an icing layer. I fly the FIKI aircraft out west to Colorado and New Mexico and encounter icing regularly. I would not attempt flying in those conditions without FIKI."

## HOW IMPORTANT IS KNOWN-ICE CERTIFICATION (FIKI) TO YOU?



hazmat charge with TKS shipments, so check the final cost closely before clicking "complete order."

The fluid is toxic if ingested, and attractively sweet tasting to animals. This is an issue with storage and spillage. It's also quite slippery. It tends to weep out of the wings for some time after use. If conditions permit turning it off several minutes prior to landing, that helps, but still expect to clean the fluid off your hangar floor with absorbent rags and warn line service folks about the dripping fluid. Pre-G3 SR22s have the tank filler on the side of the fuselage, so spillage is an issue.

Kilfrost has a low-toxicity, more bio-friendly product called TKS Sustain that's approved for the Quest Kodiak. Other approvals are in the works. We weren't able to find any for sale in the U.S. for this report, but Kilfrost says it will be selling it directly as more approvals occur.

A few owners reported corrosion, both on metal wings and metal control surfaces of composite aircraft. Kevin Hawley, President of CAV Aerospace that sells the system

told us they haven't seen reports of this recently, but it has been an issue in the past. The culprit isn't the TKS fluid—it's not corrosive—but water getting between dissimilar metals. The TKS panels must not be in contact with the metal of the wing. Poor installation (as was the villain with well-known corrosion problems on some Hawkers) or stripper from repainting are strong candidates.

We've seen corrosion on some Cirrus elevators that might be TKS related. Hawley says that it's possible the fluid is carrying water into tight spaces and could be a factor, but with on proper installs, CAV isn't seeing this issue. TKS fluid is hydrophilic and it is operating in a wet environment, however, and CAV is investigating getting anti-corrosives added to TKS fluid formulations.

There is a speed penalty for simply having the TKS system installed on the wings without the fluid running. It seems most significant on long-body Mooneys, where anywhere from five to 10 knots is reported. For the Cirrus, it's only three to five knots and for draggier airframes,

like the Cessna 206 or 210, it seems undetectable.

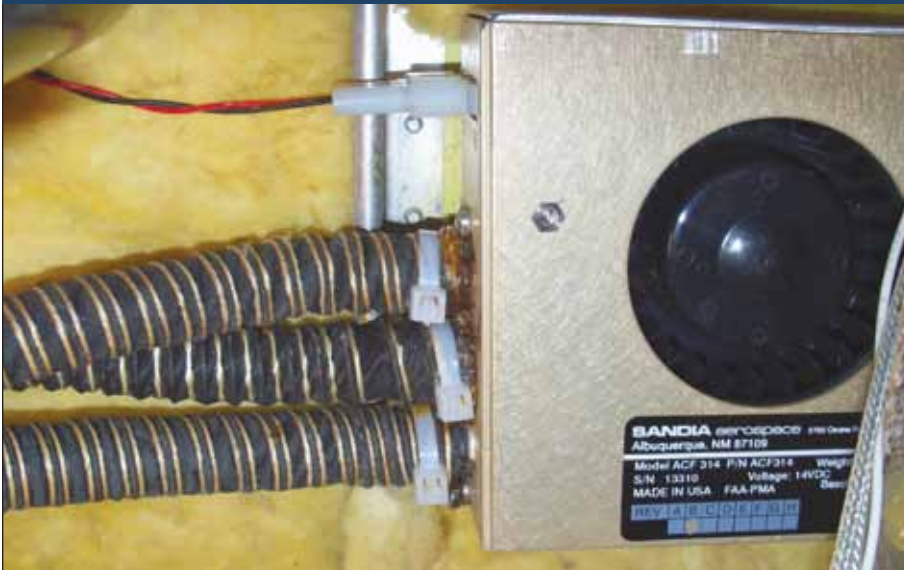
Other than regularly running the system, we saw few complaints about hardware failures. Most problems were from pores getting clogged on the wings either from disuse or general grime. Water can also freeze overnight on the leading edge blocking pores. Making sure it's fully working is another good reason to turn it on before hitting the ice.

### WORTH THE MESS

No system that requires handling toxic liquids or preemptive activation can be called ideal, and no system can handle any ice Ma Nature could dish out. But TKS delivers on its promise of keeping the airfoils clear enough for long enough for that gray matter of yours to find some ice-free air or a runway.

### CONTACTS

CAV Aerospace  
888-865-5511  
www.weepingwings.com



# Avionics Cooling Fans: Don't Fly Without One

*All brands get the job done, but Sandia excels. The important part is having a working system. Call it cheap insurance against roasting expensive gear.*

By Larry Anglisano

**T**hat whirring sound coming from the depths of your instrument panel is the sound of your checkbook being spared expensive repair bills. Don't hear the soothing hum of an avionics blower motor? You might think of installing one. Today's avionics live in a harsh environment where high-end temperature is the destructive enemy.

Part of the TSO process includes temperature threshold testing. Gar-

min's popular GNS430 navigator and G1000 GDU displays reveal a published high-end operating temperature of 55 degrees C. These units meet the TSO spec without external cooling, yet Garmin's technical advice is that reducing the operating temperature by 15-20 degrees C doubles the mean time between failures (MTBF). And that's for new avionics that produce less heat than some old gear.



*Even with a good fan installed, periodically inspect the hoses to ensure they're still attached.*

That's why we think every avionics retrofit should include a circulating-air cooling system. If there's already a fan installed, a careful evaluation of the associated cooling hoses and the health of the fan should be in order. This is even more critical in all-glass airplanes and their big displays.

## THE CHIMNEY EFFECT

Manufacturers wisely switched to surface mount circuit boards and modern designs that are engineered to draw less current, but radiant heat is the enemy when it comes to longevity. Even though some avionics have internal fans, it's the build-up of standing heat that does the expensive damage in hot weather ops. Units packed tightly in the stack heat each other through convection, radiation and by direct conduction. (As an aside, internal fans may not run on backup power. Aspen's EFD-series PFD and MFD displays have fans to keep them under their limit of 55 degrees C, but they don't run on the backup battery.)

Transponders, DMEs and autopilot controllers mounted at the bottom of the stack usually generate the most heat. This sets you up for radiated heat often called chimney effect. Avionics cooling fans push hot air away from the equipment chassis out of the front of the stack.

Many avionics units have 5/8-inch diameter air fitting on the mounting rack designed for mating with a cooling hose. One cubic foot per minute of airflow at a pressure equal to .01 inches of water should do the job.

## A FEW CRITICAL DETAILS

If you're installing the fan yourself, as with a homebuilt, or discussing it with your shop, there are some essentials to keep in mind.

*Many modern units, such as this Garmin GNS 430, have built-in chassis fans to pull heat out, but they do nothing to move stagnant air away from the stack. Some systems have ports forged into the backplate for ducting connections.*

The fan sucks in cabin air, so the area around in the intake should be open. We once found a fan sandwiched on the inside of an interior sidewall of a Cessna P210—a hot environment to begin with. Even with a three-port blower, the full stack of radios got smoking hot. Moving the fan out of the kick-panel made a world of difference. For twin-engine airplanes, the nose baggage area is an excellent location.

As you would expect, the fan wiring is simple: power and ground. But there are divergent schools of thought on whether to wire it to the primary electrical bus or to the avionics bus. On the avionics bus, it comes on when you throw the avionics master. But wiring it to the main bus could offer more protection because it runs immediately at startup, and continues to run during the shutdown sequence. This is the preferred interface, in our view.

Ugly fan wiring can induce motor noise into the audio system. Proper wiring technique is essential, even with high-quality EFI/RMI filtered motors. You'll also want to keep cooling hoses out of the controls, where chafing and binding can occur. Controls can tug on the hoses, pulling them off the cooling ports.

### SANDIA SAFE FANS

Sandia Aerospace brings heat-alerting front and center with the SAFE line. The 128 (one port), 328 (three port) and 528 (five port) units alert the pilot of impending motor failure so the problem can be addressed without continued operation and subsequent damage. The software in many Garmin G1000 suites can monitor this fault communication output and display the warning as an on-screen message alert.

Those big G1000 displays don't have integral fan systems, so the drill is to direct forced air to the back of the display

*We like the fault monitoring of the Sandia systems, as it can be easy to miss that the fan stopped working.*

chassis as many OEMs have done. For non-glass applications, the Sandia SAFE fans can be interfaced with a panel-mounted annunciator for displaying the warning.

For aftermarket retrofit, Garmin markets the three-port GFC314/328 series, which are the ACF-series made by Sandia and move 25 cubic feet of air per minute. These fans use hardy and quiet brushless motors that are rated for 78,000 hours of continuous operation. Many shops prefer the Sandia/Garmin models because they are FAA and PMA approved, elimi-



nating the need for a silly field approval.

### LONE STAR CYCLONES

The Cyclone series from Lone Star is available in various port configurations and is built to high standards. Designed as a King KA-series cooling fan replacement, the \$349, PMA-approved Cyclone 600 pushes 45 CFM of air and has six output ports, a brushless motor and weighs just over 13 ounces. What we like the most about the Cyclone is its flexibility for

FAN MODEL	PRICE	PORTS	SIZE	COMMENTS
<b>SANDIA</b>				
ACF314	\$195	1	5.1 x 2.1 x 2.1	OFFERED BY GARMIN, PROVEN QUALITY
ACF528	\$275	5	5.1 x 6.7 x 2.1	LARGE CAPACITY
SAFE128	\$210	1	2.3 x 2.8 x 1.4	LIMITED GROWTH POTENTIAL, AXIAL DESIGN
SAFE328	\$490	3	5.5 x 4.7 x 1.2	FAULT DETECTION
SAFE528	\$590	5	5.1 x 6.7 x 2.1	LARGE CAPACITY, FAULT DETECTION, TSO PENDING
<b>LONE STAR</b>				
CYCLONE100	\$129	1	1 x 2 x 2	TINY DESIGN FOR TIGHT SPACES
CYCLONE21	\$169	3	3 x 3 x 1	DURABLE HOUSING, QUIET MOTOR, FAIL MONITOR
CYCLONE600	\$349	6	4.5 x 3 x 6.25	IDEAL FOR KING KA-SERIES REPLACEMENT
<b>TROLL</b>				
FN200	\$199	3	5.7 x 1.3 x 4.8	RELIABLE, BUT NON-TSO COMPLICATES APPROVAL
FN300	\$275	5	5.7 x 1.3 x 4.8	SMALL FOOTPRINT FOR A BIG FAN
<b>AMERIKING</b>				
AK950F1D	\$119	1	2.6 x 2.5 x 2.5	DIRECT MOUNT FOR SINGLE COOL APPLICATIONS
AK950F2	\$158	2	5.7 x 1.3 x 4.8	TWO PORTS IS GOOD OPTION FOR STARK PANELS
AK950F3	\$185	3	5.7 x 1.3 x 4.8	POLARITY PROTECTION
AK950F5	\$265	5	5.7 x 1.3 x 4.8	ROOM FOR EXPANSION OR CAPPING UNUSED PORTS
AK950F10	\$406	10	1.3 x 4.9 x 5.8	SPACE EATER, BUT HUGE CAPACITY

# OLD SCHOOL COOLING DOESN'T GET IT DONE

Back in the day, aircraft manufactures had the smart idea of using outside ram air to pump cooling air into the radio stack. The ram air is captured through an outside vent often placed on the leading edge of a wing. While the idea was grand, it was far from efficient and can be damaging to modern gear. Avionics manufacturers now frown on the design, and for good reasons.

First, when flying through heavy rain, the potential for inducing water into the scat hoses is a major concern. We've seen our share of radio cases coated with corrosion and ugly green crust due to water ingestion. And damage aside, it's hardly effective cooling. Outside ram cooling is useless when the aircraft is stationary, like when you're sitting in a baking run-up area waiting for clearance on a



90-degree day. We've measured radio stack temperature nearing 160 degrees F on hot days. That's avionics failure

waiting to happen.

We also don't like cooling packs. These are air boxes of sorts that bolt to the side of the radio rack. Outside ram air is pumped into the air box and dissipated through small holes in the side of



the box. They don't give the push of airflow like an electric forced-air fan, and the bulky cooling box just gets in the way. Cooling fans require space for mounting, but they're far more flexible. So are the cooling tubes that feed the cooling air. Pulling old cooling plumbing from behind the panel is a worthwhile effort in many old panels.

Lastly, how the radios are racked in the avionics stack tells a lot about the experience of your shop. The pros leave 1/8 inches or more space between mounting racks for air circulation. These are also the guys who will spot old and ineffective cooling systems, and suggest replacement.

mounting vertically, horizontally, or at a 45-degree angle.

Lone Star brags about their laser-balanced impeller and high-impact Phenolic housing. The Lone Star units are proven; the Cyclone 21 three-port model has been around since 1990. It's also small, measuring 3 x 3 x 1 inches. For single-radio cooling, Lone Star has a tiny 1 x 2 x 2 model that weighs only 52 grams and costs just over \$100.

## TROLL AVIONICS

If you don't have a lot of equipment in the stack but are still concerned about heat affecting a single unit, an axial fan is an option. This is a single-port fan that essentially bolts to an avionics mounting rack. These fans don't need much space, but they leave little room to grow as you add

more equipment. Troll used to offer the FN100 single-port 'Cool Can' but discontinued the unit for this reason.

The better choice is a multi-port blower even if you don't use all the outputs. The three-port Troll FN200 Icebox is a proven reliable blower and is spec'd to move 7 CFM out of each port. If there aren't a lot of boxes to cool, many techs will cap one or more of the ports for more push. Troll also makes a five-port model (FN300) for panels that are really loaded. The fans come in 14- and 28-volt flavors, but don't carry official FAA approval. That's left to the shop to handle. Piper uses a multi-port Troll blower for cooling the equipment in the Meridian turboprop, which says something for perceived quality and reliability.

## AMERI-KING

The AmeriKing AK950-series fans seemingly mimic the Troll design but are PMA- and STC-approved. Available in one-, two-, three- and five-port flavors, the AK950 units use universal mounting schemes for interchangeability. The company's single-port AK951-F1 model

is inexpensive, selling for just over \$100. We wouldn't bother with the two-port model. The three-port model just makes better sense. For serious cooling, Ameri-King offers a 10-port unit, but we can't imagine having that much scat tubing behind most GA instrument panels.

## CONCLUSION

Modern avionics with surface mount circuit design are a double-edged sword: They allow for a smaller footprint, but this makes them more sensitive to radiant heat in the stack. Don't assume your shop will install a traditional avionics blower during an avionics project. Look for this line item in the proposal and ask what kind of fan, and the number of ports, is being installed. On average, a three-port fan will cost around \$600 installed. If you don't have one and are opening up the stack for some other replacement or maintenance, that's the time to put one in.

If your aircraft is equipped with a fan, watch for overly hot avionics or excessive noise from the fan during preflight. Fan failure could mean expensive avionics to follow.

*Larry keeps his cool at Exxel Avionics in Hartford, Connecticut.*

## CONTACTS

AMERI-KING  
714-842-8555  
www.ameri-king.com

SANDIA Aerospace  
505-341-2930  
www.sandia.aero

LONE STAR Aviation, Inc  
682-518-8882  
www.lonestaraviation.com

TROLL Avionics, Inc.  
805-641-2028  
www.trollavionics.com

# Private Pilot Test Prep: Sporty's, Gleim Excel

*Sporty's course is mid-priced, with an appealing combination of video dazzle and informational content. Gleim is for students who prefer traditional study.*

by Jordan Nations

**T**he FAA private pilot written test often proves to be a daunting task for the student pilot, requiring hours of study that prove to be the undoing of many would-be pilots. Although the traditional ground school suffices for some, the established trend seems to be computer-based home-study programs, of which there are a handful of options.

For this report, we're examining multi-media options from five well-known suppliers, comparing both DVD-based and online-based offers. The field can be split into two categories: a traditionally simple modular style that resembles learning from a textbook and a more state-of-the-art, visually intensive approach that makes extensive use of real instructors, in-flight video and graphics.

As we see it, a home-study knowledge course of either style should aim to fulfill three main criteria: Most important, it should cover all of the material necessary for the test in an easy-to-use and digestible format. It should prepare the student to pass the written through efficient use of time and, last, the cost should be reasonable for a product that's only used once. If taking the course requires a big investment, it should return a high value. Here's how they stack up.

## SPORTY'S

The private pilot course from Sporty's Pilot Shop, offered either on DVD or online, exemplifies strong integration of in-flight video, experienced instructors and accompanying graphics buttressed

by comprehensive notes. It also has a well-designed written-test prep section that gets right to the point of the FAA's questions.

When initially logging onto the Sporty's course, the most noticeable element is a well-designed and functional home page. The student can easily access the video training, syllabus, practical test standards, maneuvers guide and written test prep all from one screen, a plus.

Hosting the series is Rob Reider, an air show announcer and pilot since 1983. Occasionally, there's also a contribution from Richard Collins, former editor of *Flying* and *AOPA Pilot*. Having a familiar and experienced onscreen persona helps bring alive the visual aids.

The ability to witness a demonstration of a maneuver at the same time the host is explain-

ing it is another definite advantage to this system. The professional video quality shines throughout the program. This means that if the subject is climbs and turns, the student is bound to see a clip of the throttle being advanced forward, the rudder being pressed, the yoke being manipulated and the sight picture from inside the cockpit change as each element is mentioned. This helps with retention.














The price is about average for these offerings, with both the DVD and online courses priced at \$215. The only downside, in our view, is the pacing. The information comes fast and furious and some students might not adapt to that style.

## KING SCHOOLS

King Schools are well known for their line of computer-based and DVD materials, and not just the private pilot course. In format, the courses are somewhat similar to Sporty's, but with John and Martha King doing the teaching. We found John King to be adept and engaging when reviewing general knowledge test questions in his video segments, helping the student to understand

*We trialed private-pilot test preps from five providers. Jeppesen and Gleim are entirely online; the rest offer both DVD and online options.*



SOURCE	PRICE	FORMATS	PROS AND CONS
SPORTY'S 800-776-7897 WWW.SPORTYS.COM	\$215	DVD ONLINE	<ul style="list-style-type: none"> <li> VISUALLY APPEALING; GOOD USE OF GRAPHICS</li> <li> VIDEO ON ALL TOPICS</li> <li> PACE CAN BE TOO FAST</li> </ul>
KING SCHOOLS 800-854-1001 WWW.KINGSCHOOLS.COM	\$398	DVD ONLINE	<ul style="list-style-type: none"> <li> INFORMATIONAL CONTENT IS HIGH</li> <li> KINGS' INSTRUCTIONAL EXPERIENCE SHOWS</li> <li> NOTE TAKING A MUST DUE TO PACE; PRICE IS HIGHEST</li> </ul>
GLEIM 800-874-5346 WWW.GLEIM.COM	\$100 FOR 12-MONTH SUBSCRIPTION	ONLINE ONLY	<ul style="list-style-type: none"> <li> NO NONSENSE, STRIPPED DOWN</li> <li> QUICKEST ROUTE TO ENDORSEMENT</li> <li> RELIES ON INSTRUCTOR TO DEMO TOPICS NOT NECESSARY FOR WRITTEN</li> </ul>
JEPPESEN 800-353-2107 WWW.JEPPESEN.COM	\$239	ONLINE ONLY	<ul style="list-style-type: none"> <li> NICE BLEND OF TEXTBOOK AND VIDEO LEARNING</li> <li> COMPARED TO COMPETITION, COURSE DESIGN ISN'T APPEALING</li> </ul>
ASA 800-272-2359 WWW.ASA2FLY.COM	\$150 WIDESCREEN \$200 BLU-RAY	DVD BLU-RAY OPTION	<ul style="list-style-type: none"> <li> BLU-RAY OPTION A PLUS. DIVERSE RANGE OF INSTRUCTORS</li> <li> LONG FORMAT HARDER TO FIT INTO HECTIC SCHEDULE</li> </ul>

not just the answer to one example, but the general concepts behind the question in order to apply them to any example that the FAA exam throws at its victim.

A definite plus found solely in the King Schools training is the practical test section with videos of John King going through the motions of a typical practical test with an actual examiner. This goes a long way towards preparing a student to take the check-ride with a of foretaste of what the test should look like.

The video style of the King course is not quite as tech-savvy as Sporty's, in our view, but it does lay all of its courses out logically in a flowchart, making it easy to track progress and see the general concepts covered in each section.

When the boxes in the flowchart are clicked, it links you to a new page

with the lessons within that subject. After all of the lessons are completed, that box gets a green check mark and the date of completion is noted.

Weighing in at a hefty price tag of \$398 for the Private Pilot Combo, which includes both the practical and knowledge test sections, this program is the most expensive of the crowd. The cost proves to be its most crucial drawback, but it does include the practical, which the others don't.

### GLEIM

In the realm of study-intensive ground school resources, Gleim clearly reigns. The stated purpose, as found in the notes section, is to "Expedite your passing the FAA knowledge test." This philosophy is clearly manifested throughout the presentations and tests. The video integration of King Schools and Sporty's

is nowhere to be found; instead the instructor is there to teach the practical skills focused solely on passing the knowledge exam.

Most of the competition has a short (three to 10-question) quiz after each section that's worded exactly the same way that it was in the original presentation. Gleim, on the other hand, has much longer tests (100 or so questions) at the end of each short section, thus exposing the student to a broader range of test questions the FAA might present.

In order to progress from the first half of the course to the second half, there's another test that must be passed with a 70 percent or better grade.

Throughout the ground school, there's a consistent, straightforward design that's attractive and logically laid out, but not glitzy. Finding the correct section or lesson outline is effortless and progress is tracked directly on the main page next to each study unit.

It's also worth noting that the Gleim FAA Test Prep Software (an extra \$55) rivals that of Sporty's and is well calibrated to the rigorous program found in the ground school program itself.

The lack of what Gleim considers "extraneous materials" translates directly into a drastically lower price. A 12-month enrollment in the Gleim online-only course, which is more than enough time to complete the full course, costs a relatively paltry \$100. For a student on a humble budget or with strict time constraints, Gleim offers an unquestionably attractive deal. But the tradeoff is a tilt toward more traditional study effort. No spoon feeding here.

### JEPPESEN

Blending the simplistic style of Gleim with the video integration of King Schools, the Jeppesen Online Training and Test Prep is also a strong contender in this market. When the student lands on the homepage, he or she is greeted by the same logical system of modules and progress tracking found in the Gleim course. Each module consists of a few sections and each section is divided into a number of different concepts.

After the narrator describes the illustration (every few minutes), the program pauses, waiting for the stu-

dent to right click a flashing “next” button at the top of the page. This component could be seen as either a convenience or a nuisance, depending on the learning style of the user. If the extra time is needed to finish taking notes or review parts of that section, it’s a great help. On the other hand, it can serve as a drawback if the student wishes to learn at a faster pace, moving through multiple concepts in a short amount of time.

The visuals included in the program are useful and clear, explaining the concept concisely and listing all of the important subjects on the right-hand side of the screen as they’re covered by the narrator. Notes are easily recorded by focusing on the conceptual descriptions listed on the page.

Lack of a visible, personable instructor leading the course may serve as a detriment for some learners who enroll in the Jeppesen course. Although it does make use of actual in-flight video to help visualize situations and maneuvers, production quality is not to the level of the Sporty’s or King School courses, in our view. At a price of \$239, Jeppesen is exactly in the middle of the market pricewise, making it an interesting option if none of the others satisfy your tastes.

## ASA

Aviation Supplies & Academics, Inc. (ASA) Virtual Test Prep offers an interesting option: the choice to purchase their DVD Virtual Test Prep set in widescreen or Blu-Ray editions, although Blu-Ray is an extra \$50 and requires a Blu-Ray-capable player.

The widescreen edition of the Virtual Test Prep comes in a box with four main lesson DVDs and one bonus “Expert Interview” DVD. Each main lesson DVD contains a few general concepts available to learn about and track your progress as the others do. This is the point at which similarities to other programs end, however.

Instead of the typical three-to 20-minute lesson found in the rest of the competition, the ASA program contains fewer, much longer video components of about 45 to 60 minutes each. Once again, the effectiveness of these depend on learning style. Some may find the longer sections beneficial to lock in details,



*Sporty's course, upper left, and King Schools, upper right, employ instructors in live lecture format. Jeppesen, above, and Gleim, right, are more bookish and less tech savvy.*

while students who like to breeze through technical material will find them a burden. Given the pace of modern life, it’s hard for some of us to find an uninterrupted hour to concentrate on a single stream of information, much less prepare for a test from it.

The format of the segments differs from the others as well. There are a few different mentors throughout the program, making use of a variety of experienced pilots to teach the material in which they specialize. For example, a pilot who is also a meteorologist serves as the instructor for the weather segments

At times the longer format can prove irritating and uninteresting and the inability to pause at a specific section and return to it without searching is a hindrance to the overall quality of the program, in our estimation.

Though lacking in some areas, the ASA course is favorably priced at \$150 for the widescreen edition and \$200 for the Blu-Ray.

## CONCLUSION

In our view, the Sporty’s course is the premier program for the student searching for a visually appealing and highly educating program that

preps to pass for the written. It has the best combination of price, production quality and overall informational content and thus the most universal appeal, in our opinion. The price, although not cheap, is fair.

For a student who’s study oriented, digests technical material quickly and is inclined to learn from a textbook, Gleim is the route to take. It’s clear, concise and to the point and, at \$100, a bargain. If you want a taste of what the practical oral will be like, consider the King Schools’ offering, although you’ll pay more for it.

As for the choice between DVD and online courses, both offer obvious advantages and disadvantages. DVD-based programs make accessibility possible in areas without broad-band access and allow playback on either a computer or DVD player. The online version eliminates the need for any physical material and can be used anywhere an internet connection is available. The choice is a purely personal one, in our view, based on the student’s tastes and predilections.

*Jordan Nations is a student pilot, writer and editor.*



# VirtualHUD Wingman: A VFR-Only EFIS?

*An inexpensive portable horizon display with Garmin GPS connectivity, the Wingman has a great display and smart features but lacks magnetic heading data.*

by Larry Anglisano

**P**ortable gadget freaks will love the idea of a handheld and battery-operated attitude display that you can plop on top of the glareshield. We hate portables for the cockpit and even we were intrigued by the \$1495 Wingman EFIS.

## HUD'S LITTLE BRO

Former NASA engineer William Steele founded VirtualHUD in 2006

### CHECKLIST



Self-contained and simple, with good upset recovery cueing



VFR-only, which makes us wonder: "Why not look out the window?"

around his ForwardVU Virtual heads-up display (HUD). The ForwardVU projects heads-up flight data on the backside of the spinning propeller while eliminating the pricey optical gear required of high-end HUD systems. The Wingman was later engineered as a stand-alone EFIS to compliment the HUD system.

Steele realized there could be a market for an inexpensive portable EFIS system. He was right. By description and price alone, interest in the product has been brisk.

Still, we wonder just what purpose the Wingman can serve since the company aggressively warns that the unit is an informational aide only. Under no circumstances should it be used for IFR flight. They then counter that by saying the unit is intended as a backup attitude indicator.

On the other hand, we've heard

that death and destruction lawyer-talk with other portable products. We read the subtext between the lines as saying, "If you auger while using the Wingman for real attitude awareness, we told you so."

## ALL-IN-ONE PACKAGE

The system is GPS based and displays standard EFIS attitude symbology (no speed or altitude tapes). All of the electronics, including the internal attitude sensors, GPS engine and antenna, are contained within the unit's thin casing. It actually resembles Garmin's aera portable GPS. The back chassis offers only a serial connector and power switch.

On the front is a crisp and bright, 4.3-inch, color touch-screen display that we found awkward to manipulate. Adjusting the screen brightness is accomplished by activating and dragging an onscreen brightness bar. It was either too sensitive or not sensitive enough for our sweaty fingers in a bouncing, hot Florida cockpit. The screen is glove friendly for pilots who favor flying with their hands in Nomex.

The horizon display is well-defined with the familiar blue on brown graphics. But here's where it differs from a traditional attitude gyro. Roll and pitch indicators show you the relative roll and pitch angle of the Wingman chassis itself and not that of the aircraft. Each "tick" mark on the roll and pitch indicates 10 degrees. Tapping the center of the horizon display mimics gyro caging or display centering. You can also adjust the pitch-level reference as you would with a mechanical gyro.

When the unit is connected to an external GPS via the power/data RS232 port on the rear of the chassis, the Wingman's data fields switch over to the data being submitted from the external GPS. Further, external GPS connectivity projects active flight path information via basic HITS (highway in the sky) path markers leading to the programmed waypoint. Fancy that.

When operating stand-alone, and once the unit acquires a GPS fix, it will display five data fields including the number of GPS satellites it's tracking, Zulu time, GPS altitude, GPS speed and GPS track. Note that this isn't magnetic heading. VirtualHUD says there would be too

much inherent interference to build in a magnetometer.

## UPSET RECOVERY

One function we liked was the upset recovery mode, which makes the unit a tool for aerobatic fun. There's no mistaking when the unit senses itself in an unusual attitude. The display goes full intensity and bright red when you exceed 45 degrees of roll, or +30 or -25 degrees in pitch.

When pitch upset recovery mode is triggered, four black chevrons indicate which direction you should be pushing for recovery. If they are pointing up, haul back. If they are pointing down, push down. The pitch and roll indicators point to the current attitude. Roll upset recovery mode is similar. The drill is to roll the aircraft so that the chevrons point to the top of the display.

Once the upset has been corrected, the display automatically reverts to its previously dimmed setting.

The Wingman was designed to be portable, but it can be mounted on the surface of the instrument panel using a supplied adapter plate. But don't plan on mounting to the control yoke as you would a portable GPS, because mounting it on a moving surface will give the attitude sensors bogus indications.

Since the unit's slide power switch is on the back of the unit, an external power switch can be used to turn the unit on and off without the need of accessing the back of the unit. This is smart thinking since surface mounting will be the only option in some aircraft. We saddled a unit up using the supplied suction cup windshield mount; it held nicely in place and offered excellent visibility thanks to that bright display.

The unit has an internal rechargeable battery, which is good for roughly two hours. We played with one unit longer than that on internal battery and it kept working. You'll want to plug it into the electrical system using the DB9 connector that

---

*The display is bright enough to see even from the back seat of a tandem. Each roll or pitch axis tick mark is 10 degrees. The unusual attitude recovery is clearly marked with chevrons—up is that way.*

terminates in an accessory plug. The unit is also supplied with a standard USB connector and can be powered by a standard USB device, including a computer, cell phone charger and solar panel charging systems.

## CONCLUSION

We're not entirely impressed with the performance of the demo units we trialed, or the responsiveness of the company in planning for this review. We had trouble with the GPS receiver lock-on in our test aircraft. We also witnessed a new owner having trouble connecting the unit to his Garmin GPS. To be fair, one of the units we tested had beta software, but a unit with later software was never delivered for testing.

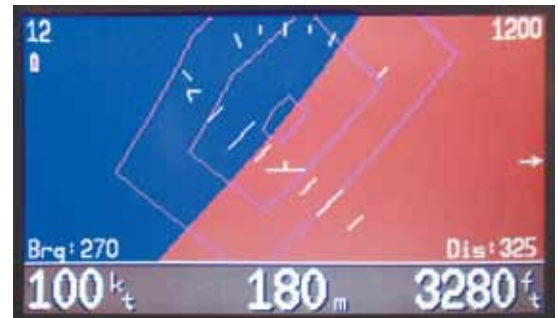
If VirtualHD plans to make a go of the product, they'll need to get the service effort down. The unit is sold exclusively through Sarasota Avionics and Gulf Coast / Pacific Coast Avionics. These are firms with a proven track record for solid customer service.

We think the Wingman EFIS could grow legs and expand into something more useful for real-world ops. An offering that provides magnetic heading would solve a dilemma for many applications. Best case is the product

## CONTACT

VirtualHUD  
www.virtualhud.com  
812-539-2846

matures to the point where it wins PMA and TSO approval, where it can actually be reliably useful when you need it the most: in the clouds. Worse case, it remains a smartly designed and portable gadget with lots of gee-whiz appeal for VFR operations.





# Cherokee 140

*Often overlooked, the baby PA-28 is a bargain on the used market and delivers good performance at low operating costs.*

PHOTO BY BALDUR SVEINSSON

In the largish universe of used airplanes, there are a handful that are often overlooked. One of these is Piper's Cherokee 140, the modest but nonetheless seminal model that literally launched a lot more than a thousand ships. The baby Cherokee was a variant of a model that marked Piper's no-looking-back departure from its rag-and-tube beginnings with the Cub. The basic concept proved a durable platform on which to build an entire company.

Today, the Cherokee 140s is a bargain, selling for prices in the low- to mid-twenties, with plenty on the market and a boatload of mods and options to upgrade them. The airplane's Lycoming O-320 was a good choice for the airplane and gave the original PA-28 surprisingly good performance.

Yet...buyers often overlook these models in favor of the newer Warrior or the 180/Archer line, which are both more expensive and more airplane than many people trying to get into flying on the cheap really need.

## MODEL HISTORY

By the early 1960s, Piper had run its course with the rag-and-tube thing.

The Cub was long over, although the Super Cub was a hot selling replacement, and the Tri-Pacer was dated and dowdy. Furthermore, Cessna was eating Piper's lunch with the 172, 180 and 182.

So in 1962, Piper went radical, dropping the rag-and-tube construction used on the Cub and Pacer and switching to an all-metal, low-wing

***The Cherokee line represented Piper's break with its rag-and-tube past and ushered in one of GA's most flexible type certificates.***

design with advanced features such as oleo-strut landing gear and an all-flying stabilator. It was downright futuristic compared to the Tri-Pacer, and even made Cessna's Skyhawk look old-fashioned.

The new model wasn't actually the 140, but the the PA-28-160. It was the brainchild of John Thorp, who also designed the innovative T-18 homebuilt, among other designs. The PA-28 was to spawn a remarkably diverse family of airplanes, ranging from the Cherokee 140 all the way up to the Turbo Arrow IV.

Even the Cherokee Six, although a distinct type, owes its birth to the humble PA-28 series. All PA-28s share the same basic design, which through its simplicity has proven to be durable and easy to maintain. Check the ads in *Trade-A-Plane* and you're likely to see Cherokee 140 examples with 8000 or more hours still in daily service. Airplanes don't

accumulate that kind of time unless the design and structure are sound and easily maintained.

With Cessna coming on strong in the trainer market, Piper needed an inexpensive entry-level trainer. In 1964, the PA-28-160's rear bench seat came out

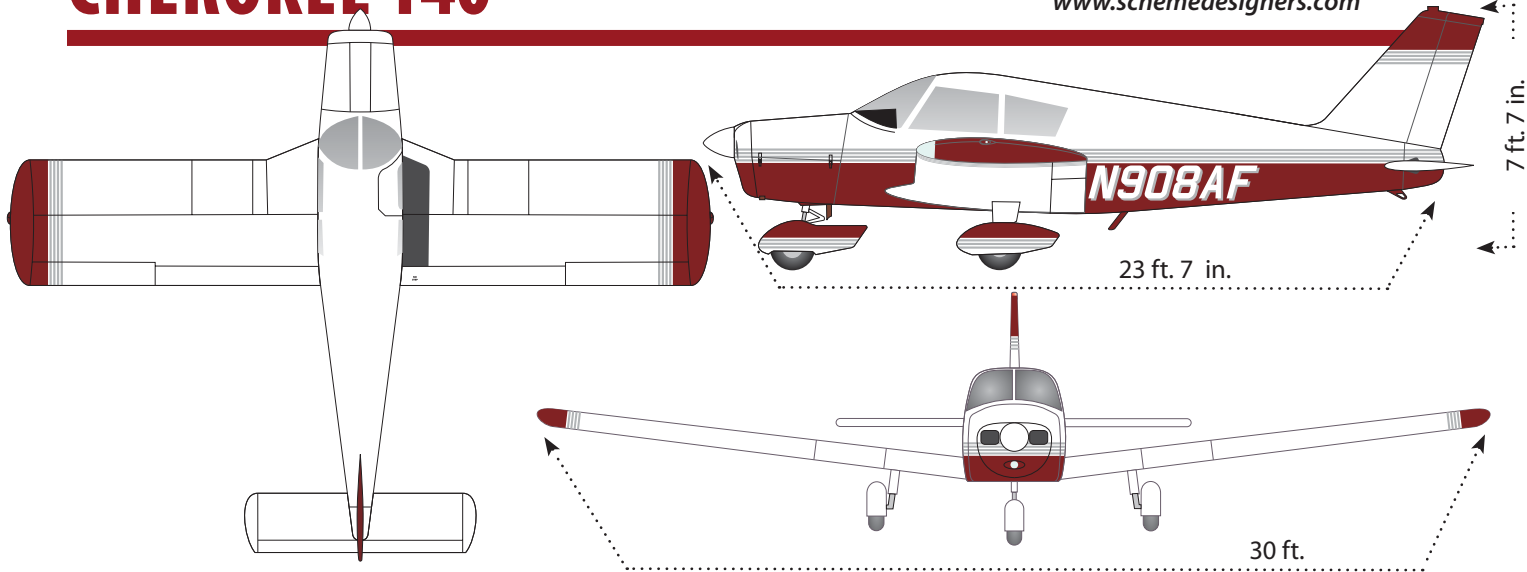
and a climb prop that effectively derated the engine to 140 HP through a limit on RPM was added.

It was basically the same idea that decades later resulted in the last downmarket PA-28 variant, the Cadet: Offer a stripped-down, low-cost version of an airplane already in production and pitch it to flight schools.

The results were mixed. Yes, the extra space in back was nice, but the 140 didn't do what the Cessna 150 did. For one thing, the 150-HP engine was more expensive to oper-

# CHEROKEE 140

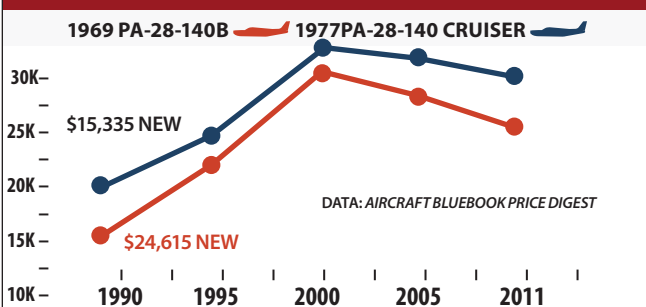
Drawings courtesy  
www.schemedesigners.com



## SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1964-65 PA-28-140	LYC. 150-HP O320-E2A	2000	\$21,000	36/50	770-970 LBS	110 KTS	±\$22,000
1966-67 PA-28-140	LYC. 150-HP O320-E2A	2000	\$21,000	36/50	770-970	110 KTS	±\$23,000
1968 PA-28-140	LYC. 150-HP O320-E2A	2000	\$21,000	36/50	770-970	110 KTS	±\$23,500
1969 PA-28-140B	LYC. 150-HP O320-E2A	2000	\$21,000	36/50	913	110 KTS	\$24,000
1970 PA-28-140C	LYC. 150-HP O320-E2A	2000	\$21,000	36/50	913	110 KTS	\$24,500
1971 PA-28-140D	LYC. 150-HP O320-E2A	2000	\$21,000	36/50	913	110 KTS	\$25,000
1972-73 PA-28-140E	LYC. 150-HP O320-E2A	2000	\$21,000	36/50	913	110 KTS	±\$25,500
1974-75 PA-28-140 CRUISER	LYC. 150-HP O320-E2A	2000	\$21,000	36/50	860	110 KTS	±\$26,500
1975-77 PA-28-140 CRUISER	LYC. 150-HP O320-E2A	2000	\$21,000	36/50	860	110 KTS	±\$26,500

## RESALE VALUES

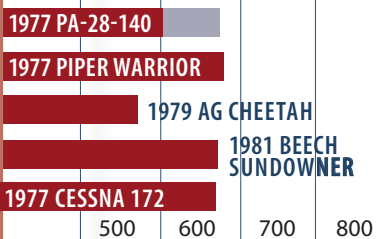


## SELECT RECENT ADS

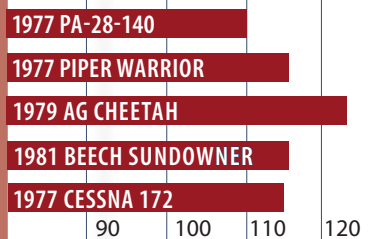
- AD 10-15-10 CONTROL WHEEL SHAFT
- AD 99-05-09 INDUCTION AIR FILTER
- AD 96-10-03 FLAP HANDLE BOLT
- AD 77-23-03 ROD END BEARINGS
- AD 75-08-03 FUEL DRAIN VALVES

## SELECT MODEL COMPARISONS

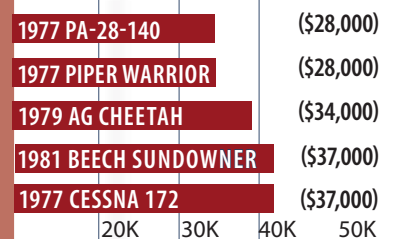
### PAYLOAD/FULL FUEL



### CRUISE SPEEDS



### PRICE COMPARISONS





*The 140's back seat is hardly commodious. But the 140 is functional for three people or two and a lot of baggage. Note the hatrack, which extends the baggage area while rarely carrying hats. (Top photo: P. Hempen)*

ate and maintain than the Cessna's O-200. Second, the 140 didn't handle like the ideal trainer. It had a mushy stall and less-than-crisp slow flight qualities.

Nevertheless, the 140 proved popular. While the Cherokee 160—and its sibling the Cherokee 150—was dropped after the 1967 model year, the 140 remained in production for 13 years before it was superseded by the Warrior. Some 10,213 were built.

In 1965, another prop was installed which allowed the full 2700 RPM and restored the missing power. A gross-weight increase was allowed and a removable bench seat was installed, yielding, well, a Cherokee 150, more or less. The rear seat was only good in a pinch, but the competing Cessna 150 didn't have that option at all. In any case, the rear seat was a good stuff catcher that pilots liked.

The design remained essentially static until 1969, when the B-model appeared. It sported the now-standard Piper throttle quadrant, a T-instrument panel and other minor changes. An upscale Cruiser model was introduced with real rear seats, not just the make-do bench, and wheel pants. The C-model in 1970 had a better engine mount that reduced vibration, overhead air vents and Piper's adjustable seats. In 1971, The D-model got a new dorsal fin, inertial-reel shoulder harnesses and an autopilot option.

The 1972 model year saw the last variant, the PA-28-140E. Optional air conditioning was offered, a unique feature in this class of airplane and probably not too desirable, given the power limitations. Subsequent model years had standard entrance

steps, standard copilot brakes, and a redesigned steering linkage. The last 140s were built in 1977 and were dropped the following year in favor of the Tomahawk and Warrior.

## HANDLING, PERFORMANCE

Although not the ideal trainer, the 140 is nonetheless easy to fly, if unexciting. That's actually a good thing: Easy-to-fly airplanes have proven to be safer than those with sportier handling characteristics.

Of particular note is the Cherokee's benign stall behavior. The fat Hershey Bar wing doesn't have a sharp stall break: Instead, it mushes along in the breeze, fighting the clean break.

In the opinion of some flight instructors, this isn't desirable in a primary trainer because it doesn't teach the student much about how to recognize and deal with ugly or pronounced stalls. For the typical pilot, however, an airplane that's hard to stall is a definite safety plus.

The 140 won't set your hair on fire, speedwise. In fact, don't even expect warm smoke. But for its class and power, it's not bad. The low-aspect ratio wing is simple and strong, but it's hardly good for climb performance. By the same token, glide performance isn't so hot, either.

Owners have told us that control forces are a bit heavier than, say, a Warrior, but that the airplane is stable, making it a good instrument trainer. Typical real-world cruise speeds range anywhere from 96 to 102 knots, even though the book calls for 115 knots at 75 percent power. Pilots count on burning about 9 GPH at 75 percent, 7 to 8 GPH at 65 percent. The speed mods described on page 30 may considerably improve speed and economy.

The 140 has a fuel capacity of 50 gallons. Piper wisely installed tabs in the tank filler necks which indicate 36 gallons, making precise partial fueling easy. In fact, the standard fuel capacity was listed at 36 gallons, with 50 gallons optional—presumably to discourage overloading.

## ERGONOMICS, CABIN

Piper obviously thought through many features on the Cherokee 140, but this yielded a mixed bag, in our estimation. We like the fully open-

ing cowl, which makes a proper engine preflight easy. We don't like screwed-down cowlings that make it impossible to see potential trouble in the engine room.

The panel layout in the later airplanes is generally good, although we would prefer engine instruments mounted closer to the pilot's line of sight. The tachometer, for example, is down near to the throttle. Logical, perhaps, but the pilot has to take his eyes off the runway to make sure the engine is developing takeoff power. Cherokees have umbrella-style fuel tank caps, which have proven to be effective at keeping water out of the tanks. Flush caps rely entirely on O-ring seals, which degrade and eventually leak.

The fuel selector is located by the pilot's left knee, on the sidewall. In later airplanes, it's a large red handle with a positive spring-loaded latch that keeps it from being shut off inadvertently. Good design, but it's located out of sight and therefore often out of mind. (That's why fuel mismanagement accidents appear prominently in the accident record.)

It's also possible to switch to a position between tanks. We prefer the design used on the Tomahawk and the Grumman singles, in which the selector is located at the bottom center of the panel in plain sight, with a handle that points to the fuel gauge of the tank in use.

As noted, the later airplanes have good, adjustable seats that are more crashworthy than those found in many aircraft. Look for S-shaped frame tubes at the front of the seat. (The "S" bend allows the seat frame to deform in an impact, absorbing energy in the process.)

Compared to other two-seaters, the 140's cabin is large and comfortable, thanks to the fuselage it shares with other PA-28s. This is in contrast to the Cessna 150, which is tight with one person aboard.

If the Cherokee's rear seat is used, there's no separate baggage bay; if the airplane is treated as a two-placer, however, there's lots of room for luggage. This makes the Cherokee 140 a much better proposition as an entry-level cross-country machine than a Cessna 150.

Cherokee 140s have only one passenger door, on the right side, and no baggage door at all. This makes



*Once again proving that anything is possible, 140s can even go on floats. Chris Coates snapped the top photo of a Cherokee in southern Ontario. Lycoming's O-320, lower photo, has proven to be a good match for the PA-128, in several horsepower ranges. The famed Hershey Bar wing, lower photo, has plenty of lift at low speeds, but also a bunch of drag. Watch for a sink fest on power-off approaches. (Photo: Klaas Reinder Sluijs)*



an emergency exit problematical, particularly for those in the back seat. The door is the standard Piper two-latch design, with a latch lever near the armrest and a separate lever overhead. This should be pointed out and explained to passengers unfamiliar with the aircraft, since the pilot has to rely on them to open the door in an emergency.

One area where all Pipers shine is the flap control. It's a big manual lever between the front seats with a push-button latch. It's simple to use and it's easy to see how much flap is out there. But it does take a hefty tug to deploy flaps.

### **BATTERY BOX ISSUES**

Worth noting is the design and



location of the battery box. It's under the rear seat, adjacent to the spar. It's also adjacent to the fuel line for the right tank, which comes through the root rib and runs up along the bottom corner of the fuselage.

This arrangement has some interesting consequences. First, the area where the fuel line enters the cabin is lined with fiberglass insulation.

This can sometimes trap water, especially since it's near the door. The water can cause corrosion of the fuel line, resulting in a potential leak. The spark source? Jumping a dead battery on an airplane not equipped with a GPU plug.

The insulation has been cited by several owners: It's a good idea to pull out at least that part of the interior and check for corrosion and sodden insulation during a pre-purchase inspection. Also, check the condition of the battery box. Leaking acid in close proximity to the wing spar is bad news.

The battery box location also means a long run for the electrical cables. To save some weight, Piper used aluminum cables for a time. Most have since been replaced with copper, so check the airframe you're interested in for that mod.

Last, check the seat structure above the battery box. In one well-publicized 1981 accident involving a Warrior, the rear seat collapsed onto the battery box lid, starting an in-flight fire. The airplane landed successfully but the rear seat passengers were unable to egress and died in the fire. As a result of that accident, an emergency AD was issued calling for a plywood support under the back seat.

In an age when owners are grow-

ing irritatingly accustomed to the AD-a-week syndrome, the Cherokee 140 has relatively few significant ADs. Most are one-time or recurring-inspection-or-comply type directives. Our sweep of 200 service difficulty reports didn't reveal any discernible patterns other than those associated with airframes that are just old. As we did during our last review, we found clusters of reports related to corrosion in the spar, around fuel line fittings and on control parts. No specific parts seemed suspect, but clearly these older airframes will benefit from corrosion protection treatments. Cracked or leaking fuel vent hoses seem to be a common complaint.

While the O-320 is considered a reliable power plant, we found some failures related to loss of power for various reasons, including stuck valves, cracked valves and heads and carburetor issues. The SDRs didn't reveal any battery box or cable issues; we suspect these have been all but sorted out by now.

**MODS, OWNER GROUPS**

Several companies make aerodynamic tweaks for the Cherokee. Notable are Laminar Flow, Knots-2-U, Horton, LoPresti and Power Flow.

Contact Laminar Flow and PowerFlow at 877-693-7356, www.

powerflowsystems.com; LoPresti at 877-565-1731 and www.speedmods.com; knots2u at 262-763-5100, www.knots2u.com.; Horton at 800-835-2051, www.hortonstackdoor.com. The various companies make simple mods such as gap seals. Some (like Horton) make full-blown STOL kits, others (Laminar Flow) specialize in parts to enhance cruise speed. Power Flow makes a tuned exhaust system.

In the past, owners who responded to our reader surveys noted that they'd installed one or more mods, usually with at least some benefit derived. Whether any particular mod will accomplish everything the manufacturer claims depends on so many factors that any promises should be looked at with clear eyes.

As with all airplanes, we strongly encourage potential buyers to join an owner's club. The Cherokee Pilot's Association can be reached through the umbrella Piper Owner Society at www.piperowner.org or 866-697-4737.

**OWNER COMMENTS**

We bought our 1968 PA28-140 newly overhauled in 2004. It has a 160-HP engine, new interior and was repainted in 1998. It was a plain-Jane IFR-ready machine except for the addition of an old GPS100 at

**ACCIDENT SCAN: A PILOT'S GOT TO KNOW HIS LIMITATIONS**

Our sentimental journey through the last decade of Cherokee 140 accidents turned up the usual suspects for aircraft of this class. Pilot total times, when reported, were lower than we usually see. This makes sense given the 140's role as a trainer and first airplane.

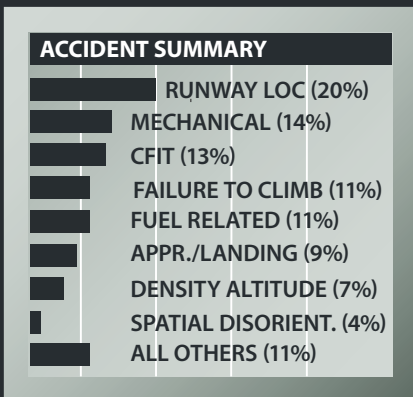
Topping the list was runway loss of control, predominately on landing. Short runways and wind from the side or behind the landing aircraft were common

accomplices. Mechanical failures ranked higher than normal, often resulting from parts fatigue. Many of the 140s in service are high-time, and have seen hard knocks from students and renters.

There were the usual CFIT accidents where non-instrument-rated pilots flew in low visibility, darkness or both, and encountered immovable objects. We were particularly impressed with the pluck of the pilot who couldn't turn on the runway lights, so he placed a couple of glow sticks to get him pointed the right way and took off. The glow sticks didn't illuminate the hillside, however. It speaks highly of the Cherokee's crashworthiness that this wreck, and many others, had no injuries.

There was a whole class of accidents—11 percent of the total—that were just failure to get much out of ground effect and ended in the trees. Many of these were overloads with four people aboard. Note that these don't include another seven percent that were clearly density altitude related. One of these involve a departure at a DA of 8500 feet. The book climb for that would have been 220 FPM.

Bottom line: The Cherokee 140 is a solid machine, but it's no performance superstar, and you still need to pay attention to which way the wind is blowing.





*By modern standards, PA-28-140 panels are rudimentary but nonetheless perfectly functional. Pete Hodges' 1969 140 still has the original Bendix/King KX-170 navcomms and the non-standard instrument layout popular in aircraft of the era.*

the top of the stack. The ADF had been removed.

We bought it because I was committed to getting my private pilot's license, and it would be a good trainer as well as a good XC machine up to 400 miles per leg. My wife and I routinely fly 400-mile trips from South Carolina.

After having it for about a year and a half, we thought about getting a larger airplane, but it was cheaper to modify this one to be a better cross-country plane for us and our primary visits with family. We added the back shelf option first, which more than doubled our cargo area by moving back the rear bulkhead about 8 inches and providing an upper hat shelf.

Now all of our bags fit behind the rear seats instead of piled high and under the seats. Cost: about \$1500. We added the Lift Reserve Indicator to get a better performance edge on the grass strip we use in the heat of summer for about \$1000. We added wheel pants and strut covers for better cruise. We can cruise 115 knots at 9 to 9.3 GPH or 110 knots at 8 to 8.4 GPH, depending on altitude and temperature. At lower speeds, we burn less fuel for training and joy

flying. We replaced the GPS100 for a GPS 196 for about \$1200, and had to rearrange the radio stack to accommodate the change. Our annuals run about \$1200 a year and our instrument check runs about \$750, unless parts need replacement.

We have had a few mechanical problems in the last six years but not that much. Had to replace the alternator twice, turn coordinator, altimeter, one radio, DG, landing light, strobe light, transponder, tach and starter. We had one cylinder fail after 300 hours. We have about 330 hours SMOH.

The aircraft is very comfortable and easy to fly and operate. I added a vernier throttle control and use it as a final trim adjustment so I don't have to look at the ceiling mounted trim while I am flying. It trims easily to any desired speed, and the rudder trim is especially useful during cruise to take a load off your feet.

I trim side to side with fuel burn and can feel it when I need to switch tanks. A 400-mile trip with me, my wife, our dog and luggage takes 3:50 with no wind and burns 32.5 gallons of fuel. We came back against a small wind, left with 42

# The Aviation Consumer

## READER SERVICES

### TO VIEW OUR WEB SITE

Visit us at:  
www.aviationconsumer.com

### FOR BACK ISSUES

See:  
www.aviationconsumer.com/backissues

### FOR QUESTIONS ABOUT YOUR SUBSCRIPTION:

Phone us at: 800-829-9081

### TO CHANGE YOUR MAILING OR E-MAIL ADDRESS, RENEW YOUR SUBSCRIPTION OR TO CHECK PAYMENT STATUS, VISIT OUR ONLINE CUSTOMER SERVICE:

Log on at:

[www.aviationconsumer.com/cs](http://www.aviationconsumer.com/cs)

To change your address by mail, attach your present mailing label to this form (or a copy of this form) enter your new address below and mail it to:

### THE AVIATION CONSUMER

P.O. Box 420235  
PALM COAST, FL 32142

Name \_\_\_\_\_  
 Company \_\_\_\_\_  
 Address \_\_\_\_\_  
 Address 2 \_\_\_\_\_  
 City \_\_\_\_\_  
 State \_\_\_\_\_ Zip: \_\_\_\_\_  
 E-mail \_\_\_\_\_

To order or renew a subscription, enter your name and address above and check the subscription term you prefer:

- 1 year (12 issues) \$69
- 6 months (6 issues) \$34.50
- Check enclosed  AMEX
- MasterCard  Visa

Card # \_\_\_\_\_  
 Expiration Date \_\_\_\_\_  
 Signature \_\_\_\_\_

**YOUR RENEWAL IS JUST A CLICK AWAY!**  
[www.aviationconsumer.com](http://www.aviationconsumer.com)



*The PowerFlow exhaust mod, left, is available for many aircraft, including the PA-28-140 series.*

gallons, landed at 4:05, having 34.5 gallons burned, 7.5 gallons on board. Not bad for the little bird.

William "Pete" Hodges  
via e-mail

In 1977, I was 15 years old and my father, Dick Brower, had just bought his first airplane, N5741F, a 1969 Piper Cherokee 140B. We went for a ride and my father couldn't stop grinning. My love of flying began that day. My father kept that airplane until I got my pilot's license and he gave it to me. In addition to the emotional attachment that I have to my airplane, the Piper Cherokee is a great airplane to fly. It was developed to train pilots and, as a result, is stable and forgiving. Stalls are non-eventful and there is no wing drop. It is also good in crosswind landings and is a good cross-country flyer, having taken my father and me to Oshkosh over 20 times.

The Cherokee is fast enough to get somewhere in a decent amount of time, at 100 to 110 MPH, but slow enough to enjoy the ride. It is also a very economical airplane, using 7 gallons of fuel per hour. It has a useful load of 850 to 900 pounds and will hold 50 gallons of fuel, enabling it to fly much longer than you would want to.

It is also economical to service, with annuals approximating \$1000 to \$1500. While replacement parts have not necessarily been an issue,

I find that because of the age of the airplane, upgrades, such as intercom systems, have increased the annual fee. Insurance is around \$700 per year. The Cherokee is a little faster than a Cessna 150 or 172 and because of the low wing, it has greater visibility. It provides a stable flight, especially convenient when flying family and friends. My Cherokee is such a good airplane that I doubt I will ever trade up.

Alan Brower  
Califon, New Jersey

The PA28-140 is a great airplane--good performance at a good price, reliable, easy to fly and affordable to maintain. I bought my 140, N6341R, through broker Leo Smith ([www.planesmithllc.com](http://www.planesmithllc.com)) of Eden Prairie, Minnesota, in August 2007. For first-time buyers like myself, shopping for a trustworthy broker may be a better use of time than shopping for a nice airplane.

A trustworthy broker will steer you to a good value and if you're reasonably cautious, you're likely to spend more on your own for pre-purchase inspections and post-purchase frustrations than you'll spend to compensate the broker.

As for me, every aspect of ownership has been a joy, including the purchase experience, despite having purchased at the most recent valuation peak and about 15 minutes before the price of 100LL tripled.

So OK, my timing could have been better. But my Cherokee is exactly what I was looking for. N6341R is a well-maintained 1966 Piper PA28 140/160. It spent most of its life in Minnesota, where it lived in a hangar and worked out regularly, but never served as a primary trainer. I keep it in a hangar in Orange, Virginia.

In my opinion, the hallmark of a well-maintained older Cherokee is compliance with Piper Service Bulletin 1006, which directs inspection of the wing spar behind the wing tanks every seven years for corrosion, treatment with anti-corrosive and replacement of fuel hoses while you're working in the wing. My airplane got its last SB1006 treatment from the previous owner in 2006; my first shot at it will be in 2013.

The airplane's interior appears to be original, but is in very good shape. The paint is good, with minor chipping here and there. The glass looks like new even though it's not. My Lycoming O-320-E2A got its 160-HP STC in 1996, in the course of a field overhaul by Bolduc Aviation Specialized Services of Blaine, Minnesota ([www.bolducaviation.com](http://www.bolducaviation.com)).

It purrs. It idles very smoothly, accelerates smoothly to redline and pulls all the way. This engine is as close to bulletproof as aviation engines get and stone simple: a sturdy, reliable powerplant. The airplane currently has 5067 hours TTAF, 487 hours SMOH and is beautifully maintained by AP/IA David Cramer at Shannon Airport, in Fredericksburg, Virginia.

In addition to the 160-HP STC, 41R has a Skytec starter, Tanis heater, and an external power socket and cable which is good for maintaining the battery but not for starting the engine. In the panel, there's one Bendix/King KX-155 navcom with glideslope, one Bendix/King 170B navcom, Mode C, an ADF (some rockin' AM radio in West Virginia!), a two-place Flightcom intercom, plus something you don't often see on vintage aircraft: an avionics master switch.

My airplane has its original panel; it's a steam gauge airplane and I like it that way. Steam gauges are

easy to read and interpret, cheap to maintain and have well-understood failure modes. The 140 has no toe brakes, only a hand-brake and I like that, too. With toe brakes, I worry about inadvertently engaging the brakes while working the rudders on landing; it happens and I've seen lots of flat-spotted tires to prove it. My airplane is worry-free on this point. Handbrake operation is safe, effective, and the muscle-memory adjustment from toe brakes is fast and easy. An added plus is that the hand-brake system is about one third as complicated as the toe-brake installation on a 140, a comfort at maintenance time.

I flightplan at 9 or 10 GPH (10 for longer legs, just to be sure) and 100 knots. My actual numbers are better than my plan, usually between 110 and 115 knots on 8.5 GPH, but fuel mismanagement has been a problem for Cherokee pilots and conservative planning helps me avoid liberal excuse-making.

I also use a three-clock countdown stopwatch from Sporty's to time fuel tank changes; when the third clock chimes, it's time to land. I have the time and fuel to do it right. I'm currently burning about a quart of oil every 8 to 9 hours with compressions in the mid to upper 70s all around. (I use AeroShell 15-50, change the oil every 25 hours and change the filter every 50.)

Annual costs have been high, about \$2750 each so far, but should come down now that older hoses, baffling, tires and other wear items have been replaced and deferred squawks repaired. That's the theory anyway. Insurance is about \$850 per year for excellent liability and hull coverage, and has come down every year I've owned the airplane.

The 140 is a joy to fly. Using the original, pre-STC weight and balance limitations, performance is always sprightly, even at max gross. Of course, even at 160 HP, the O-320-E2A is still a normally aspirated piston engine, so max-gross takeoffs on high density altitude days are best undertaken respectfully. Still, with a useful load of 867 pounds, I can fill 41R's four seats with people of more or less normal sizes and have sufficient performance for safe operations under all but the most severe density altitude conditions.

With one or two souls on board, 41R gives me excellent hauling capability for an aircraft of this class, better than most, in my view. And although the single door and low wing can make loading feel like a yoga class, it's easy to remove the rear seats with simple hand tools and arrange neatly whatever you can muscle through the door.

Climb performance varies from pretty good—about 1500 feet per minute at sea level lightly loaded on cool days—to sedate. At 9500 feet MSL on a hot day, 41R is stable and not at all twitchy, although the last 1000 feet takes over five minutes. Without an autopilot, cruise at any altitude is slightly more engaging than in a Skyhawk.

The airplane displays excellent stability in yaw and roll, but slight oscillation in pitch that requires constant attention. If you accept the pitch oscillation and the slow sine-wave deviation of about 100 feet in altitude that goes with it, the 140 can be trimmed and flown hands off, using gentle rudder pressure to hold the wings level against atmospheric vagaries. With a couple of fingers on the yoke and a little practice, the 140 can be flown with precision in all axes.

Landing the 140 is just too easy. It leaves us Cherokee pilots with few excuses. With the original Hershey bar wing, the Cherokee 140 has about zero tendency to float; pulling the throttle brings it down right now. The key to good landings in the 140, in my view, is throttle management: Set pitch and use the throttle to adjust glideslope. Carry a little power to the threshold and smoothly close the throttle while holding the nose up. The 140 rewards a well-judged flair with a satisfying chirp and protests a lesser effort with a resounding clunk, but the robust gear takes it all in stride either way.

In my opinion, the Cherokee 140 is the perfect blend of simplicity and capability. I heartily recommend a well-maintained older Cherokee 140 to anyone looking for basic aviation, classic good looks, simple, strong and proven metal construction, low costs and surprisingly fulsome capability.

Joe Corrao  
Fredericksburg, Virgin

# AVweb+

## AVweb's TOP FIVE

- **Podcasts** – *Biweekly podcasts with aviation newsmakers*
- **Brainteasers** – *Put your aviation knowledge to the test with these interactive quizzes*
- **Video of the week** – *Some of the most interesting plane and pilot videos around*
- **Picture of the week** – *A showcase for our readers keen eyes an impeccable taste in aerial photography*
- **The Pilot's Lounge** – *Need we say more!*

All this and more  
**FREE**  
at [AVweb.com](http://AVweb.com)



**SUBSCRIBE  
TODAY!**

at  
[AVweb.com/register](http://AVweb.com/register)

## Letters

(continued from page 3)

the lower section and distant vision through the upper portion.

The location of the transition from reading to far vision is known as segment height. Most sunglasses will be ground to about a 50/50 ratio, which means you can read by the pool and drive with about equal ability. This works well for most people. But for some pilots, it will cause difficulty.

Pilots who spend a lot of time looking at the ground, such as helicopter, glider, search and rescue and other pilots with canopies or windows that are low in the cockpit, will find themselves looking through the reading portion of the sunglasses at far objects. This means more fatigue, less visual perception and a greater likelihood of air sickness.

The solution is to request as low a segment height as possible. The resulting glasses, for me at least, will allow you to easily read the details of charts and detailed text information from flight computers without interfering with distant vision.

I've only been able to compare neutral density (grey), Serengeti and Eagle Eye Sun Tiger glasses. So far, the Serengeti glasses have been the clear winner. You criticized the Serengeti glasses for being heavy. I agree.

My original (ground from glass) Serengetis were far too heavy to be comfortable in the long run. My new Serengetis, progressive ground with a minimum segment height out of some kind of plastic, are absolutely fantastic and I hope I never have to fly without them. I'm sure others

are equally as good and I hope to see you compare them.

Brian Hood  
via e-mail

### Long-Term Support

As an aircraft owner and one who has an Aspen installed, what is going to happen 10 to 20 years from now when the electronic processors fail?

Will manufacturers such as Garmin and Aspen be able to service these units? We know computers become obsolete in about two to four years, buy what about aviation products? I think this is a good subject to look into. The mechanical instruments can be repaired, but what about the electronic ones?

Jeff Aryan,  
Corona, California

*It's a good question and one we have already answered. See the article in the March 2010 issue for the details. The short answer is support will be available for a long time, but not forever.*

### Kitfox Correction

In your review of the Kitfox in the December 2010 issue, there was one major error that I would like to clear up. The company did not go through a bankruptcy in 1999. It was an employee buy-out that took effect in January 2000 only.

They did file for bankruptcy in 2005. So essentially, the Kitfox was not in production from October 2005 to April 2006; otherwise, it has been in continuous production since 1984.

John McBean  
Kitfox Aircraft

## FEEDBACK WANTED

### TRINIDAD



For the June 2011 issue of *Aviation Consumer*, our Used Aircraft Guide will be on the Aerospaciale Trinidad. We want to know what it's like to own these slick retract, 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 Trinidad by April 1, 2011, to:

Aviation Consumer  
7820 Holiday Drive South  
Suite 315  
Sarasota, FL 34231  
(preferred) e-mail at:  
avconsumer@comcast.net

### iPAD Charger?

I purchased an Apple iPad per your suggestion in the article in the December 2010 issue. My question is: Where can I purchase a 24-volt-to-USB power adapter for my iPad when I am in my airplane?

Bob Rogers  
Via e-mail

*A web search for "24v to USB cigarette" tuned up some options from BatteryBob.com and Amazon.com for \$12 or less that should do exactly that. Some offer multiple plugs. We haven't tried them, but there's no reason they shouldn't work. Both Sporty's and Aircraft Spruce sell 28-to-12 volt converters which would allow you to use a 12-volt automotive charger with the iPad.*