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owners

# The Aviation Consumer®



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## FIRST WORD

### Blue Screen of Death in the Cockpit

Maybe I emit some kind of weird electromagnetic field, but it seems if there's a way to get a computer to crash, I'll find it. Back in my dot.com, tech-writer days people loved to have me beta test software because I'd break it within five minutes. I've even found bugs in MFDs weeks before certification.

This knack held right into our EFB trials that you'll see on page four. We had started up the engine and I was having trouble getting the device to respond correctly. Simple solution: reboot. Not a big deal as it boots up pretty fast—except that it wouldn't shut down. It sat there running ... and running ... still running. Finally, the taskbar disappeared and the shutdown process commenced. Then the reason for the long delay became crystal clear: "Do not shut off your computer. Windows is installing updates."

Installing updates? We're taxiing to the runway for freakin' takeoff and the test device is installing updates? No one had turned off the automatic updates

for this tablet computer and it found some when it updated its navigation data back at the office. There was nothing to do but wait. Good thing we weren't depending on it for a taxi diagram or local frequencies.

This kind of thing is sadly common when testing cockpit devices based on off-the-shelf consumer electronics. The stuff works *almost* all the time. I had a '76 Rabbit that worked almost all the time, too, and I get the same feeling about using one of these EFBs as my primary chart reader and map during an instrument approach that I used to get driving that Rabbit through South Boston at two a.m.

It's a tradeoff. These EFBs offer far more capability at a much lower cost than a Garmin 696. But I've never worried about a purpose-built, aviation GPS crashing just when I needed it most. OK,

I admit, they do fail and every electronic device needs a backup. But I bet if you polled 20 users of a Garmin or Honeywell portable GPS you'd be lucky to find one who had seen the unit completely fail. Do the same with folks who use laptop software—and that's what these EFBs are—and you'd be lucky to find one who had never seen a lockup requiring a restart.

There's a second level of annoyance with these devices. Some functions are an almost fit because the hardware just wasn't quite designed for it. Most aviation portables have built-in GPS. These EFBs require Bluetooth connections to separate GPS units. Not a big deal, but it's one more thing to charge, to carry, to fail to connect. The touch screens sometimes have trouble distinguishing between a tap and a drag, especially in turbulence. I happen to have a Garmin aera and Honeywell AV8OR in my office now, too. Neither of these devices has that problem with their touchscreens. But, then again, I can't check my email in the FBO with an aera or AV8OR either.

The simple fact is that I'm willing to put up with a lot more futzing and instability in the comfort of my office chair than I am while wrapped in aluminum and moving three miles a minute. For me, the value of these EFBs still falls short of overcoming the annoyance on any of the options available today.

A factor in that might be my flair for making computers crash. I prefer avoiding crashes of any kind when it comes to airplanes. —Jeff Van West



## Cirrus Comments

Nice article in the February 2010 issue on the Cirrus SR20. I would like to add some comments/corrections. I own the number two all-electric SR20 (s/n 1269) having taken delivery in January 2003 (boy, was it cold up there then). I have 650 hours on it now and generally have been very pleased with it.

You mentioned a \$1200 cost for replacement of the reefing cutters every six years. There are two of these and at slightly over \$1000 each, it's slightly over \$2000 to do the job. The number two alternator is a 20-amp B & C unit, same as used on the Bonanza, not the 35-amp unit you referenced. The carbon fiber wing used in the G3 is

50 pounds lighter than the original wing. That, plus the 50-pound increase in gross weight gives you a nice 100-pound increase in useful load.

You mentioned empty weights are typically 2000 pounds. My 2.1 version was 2136 pounds. My airplane is not heavily optioned and I think this weight is more typical.

I am mystified by the comment of one owner about a sharp wing fall off in a stall. All the Cirrus airplanes I have flown have exhibited very benign stall characteristics, probably the best I have ever flown. I wonder if one of his stall strips is missing. Except for the comments above, it was very accurate.

Jim Scott  
Wilmington, Delaware

## And The Winner Is...

Thought I'd spare you the trouble of doing another flashlight article and just declare the winner. I think it's the Fenix L2D. It uses two AA batteries, can be had for about \$50

from Amazon and although you can't use it to clobber someone over the head as you could with a six D-cell mag lite, it does everything else and more.

This delivers four different levels of light: Low, which is perfect for cockpit use, medium and high, which are better for preflighting at night. The highest use is the "turbo"

mode, which delivers 180 lumens (with two AA batteries) but only for an hour or so.

It's made in China like everything else, but it has a quality, military-grade feel to it. The batteries probably won't last very long unless you use it in the low mode, but it uses a Cree LED bulb,

which should last forever and is extraordinarily bright if you need it.

It also has strobe and SOS modes, which you will probably never use, but it's nice to know they are there if you need them. No idea about the longevity of this light. But it's only \$50, it's small (6 inches long and about the diameter of a AA battery) and impressively bright. Check it out. I don't work for the company, just love the product. I also have a Surefire 9P with an LED modification and this is better.

Name withheld

## Flight Planning Simplicity

Great article (as usual) on flight planning. I won Seattle's Voyager in a contest a couple of years ago. You described it very well. It is robust and full of so many features that unless used weekly, it becomes difficult to use. They keep adding great features all the time, making it that much harder to use.

They have excellent customer service, but even though I have a

free copy of Voyager, I find myself using Fltplan.com which is free and extremely straight forward. It has 95 percent of the features I need.

One additional comment on EFB's: I purchased a Kindle DX as a result of your article a few months ago. While it stores everything but charts and is fairly easy to navigate and the display is about the same size as a chart, it is not as easy to view as a paper chart because the contrast just isn't there.

I have no problem reading books on the Kindle, but reading an approach plate requires a flashlight (even in daylight) or a magnifying glass. Keep up the good work; a great magazine even for us King Air drivers.

Frank Singer  
Huntington Beach, California

## That Ain't No Rocket

It's hard to fool a Mooniac. That's not a Rocket on page 29 of the March issue and it's not a TSIO-520-NB under the cowl, nor is it at K-model.

That is a Missile with an IO-550-A5B. That's a J-model. The giveaway? The scimitar prop!

Rae Willis  
Falmouth Airpark

*We hate it when you're right. But you're right.*

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**Both ChartBook and Skypad use the beefier 2Go machine (on the right). Vista uses the lighter T91.**

and that's why no one solution is the right one for everybody. In all three cases, there's a flight planning program and we've already reviewed those in our January 2010 issue. The three contenders here come from the same companies—Flight Prep, RMS Flitesoft and Seattle Avionics—but now we're focusing only on the inflight modules. We're also looking specifically at the ready-to-fly packages offered by each company. You could roll your own EFB using any of these programs with your computer.

There are a couple of global things we can say about all three devices we tested. All have excellent battery life, performing fine on a three-hour flight, but you'll want to plug them in to ship's power for best performance. Direct connections to 12V systems run around \$50 and 24V systems are over \$100 (using a 24V-to-120V inverter is a cheaper solution). All systems update automatically from the internet. These things all weigh between two and three pounds, which gets heavy in your hand. Yoke and suction mounts can be had for about \$60. All three companies have been around for a while with solid user bases and good histories of customer support.

## Tablet-Based EFBs: ChartCase Wins by a Nose

*What constitutes "best" really depends on how you plan to use the EFB. Power users will prefer the Voyager Skypad, but we like simplicity in the cockpit.*

by Jeff Van West

We get a steady stream of requests for reviews of electronic flight bags (EFBs). In theory, they make sense: all your charts and approach plates in one place and geo-referenced so you can see your exact position, up-to-date airport information at your fingertips and a pre-flight planning tool that becomes the in-flight resource without reentering information.

In practice, we're in a Dickensian "best of times, worst of times" state where the technology is marginally up to the task and no one has quite nailed the software. All three of the solutions we tested for this article get the job done—approach charts, sectionals, airport information, XM weather, a moving

map GPS—it's all there. All have touch-sensitive screens (that work with gloves on). All are available as ready-to-fly solutions and meet the FAA's requirements as Class 1 or 2

### CHECKLIST

- + Approach plates and charts all in one package and updated automatically.
- + Support for geo-referenced charts, terrain awareness, datalink weather and Zaon traffic
- Ease of use, cockpit ergonomics and overall reliability is far from perfect.

EFBs.  
Where they differ is in execution,

### FLIGHTPREP CHARTBOOK

We felt immediately at home with the ChartBook running in its inflight mode. Buttons were big and clearly labeled. The screen is divided into two major sections (upper and lower or right and left depending on portrait or landscape view). One combination might be your flight plan and a sectional chart. The chart would show your aircraft with the option of showing airspeed, altitude and heading as flight tapes or as boxes in the corners. Another combination might be an approach plate and a terrain-awareness page. Either section can be expanded to fill the whole screen with a touch and it's only two taps to navigate to a different screens.

The ChartBook plots the aircraft's position on computer-generated

COMPANY	TECH SPECS	HITS +	MISSES -	WARRANTY	HARDWARE	FULL CONUS SUBSCRIPTIONS
FlightPrep ChartCase	9.5 x 7.5 x 1.5 in 2.8 pounds 8.9-inch screen	Simple, big buttons, highly configurable, fast rendering	Find function non-standard, tap-intensive for some functions, cost	One-year (three-year \$200; three-year, no-fault \$400)	\$1796	\$357/year
Flitesoft EFB	9.5 x 7.5 x 1.5 in 2.8 pounds 8.9-inch screen	Simple, flight panel and emergency windows	Limited touchscreen optimization, weakest display of scanned charts	Through PC manufacturer only	\$1200 for Pro \$1500 for Commercial	\$238/year Pro \$338/year Comm
Voyager SkyPad	8.9 x 6.5 x 1.1 in 2.1 pounds 8.9-inch screen	Powerful, highly configurable, best data access and integration	Steepest learning curve, small type and buttons, responsiveness can be slow	One year	\$1095 (\$1354 with SS drive)	\$299/year \$829 lifetime

moving maps or sectional, low, high or TAC charts of your choosing. These are actual scanned charts that zoom and scroll smoothly. One feature we grew to appreciate was a dedicated "chart" button that flipped us to the chart of our choice no matter what screen we had been viewing a moment before. There is a similar "IP" button to return to the last loaded approach plate. It's another tap to see a list of recently-viewed approach plates. Ease of navigation is a big plus in the cockpit, and these quick switches let us effectively use lesser features, like the checklist page, because critical information was one sure tap away.

Not everything was intuitive or clear, however. We had a lot of trouble getting our brains around the interplay between the nearest, direct

and find functions on the Chart-Book. Nearest is simple enough and shows current bearing and distance, as well as if an instrument approach is available. Selecting an airport and hitting direct will insert that airport as your next waypoint and navigate you in that direction (perfect for emergencies or diversions). Or you could tap the IP button to see approaches for that airport.

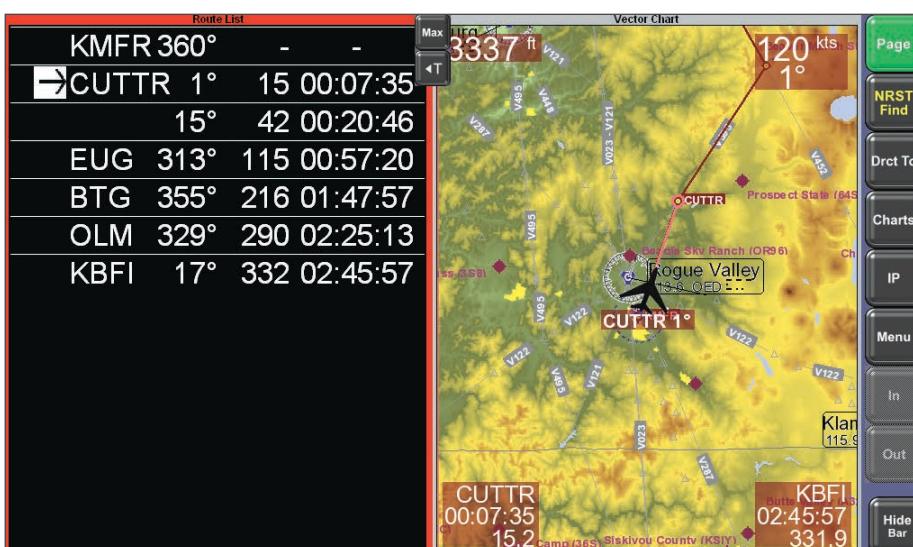
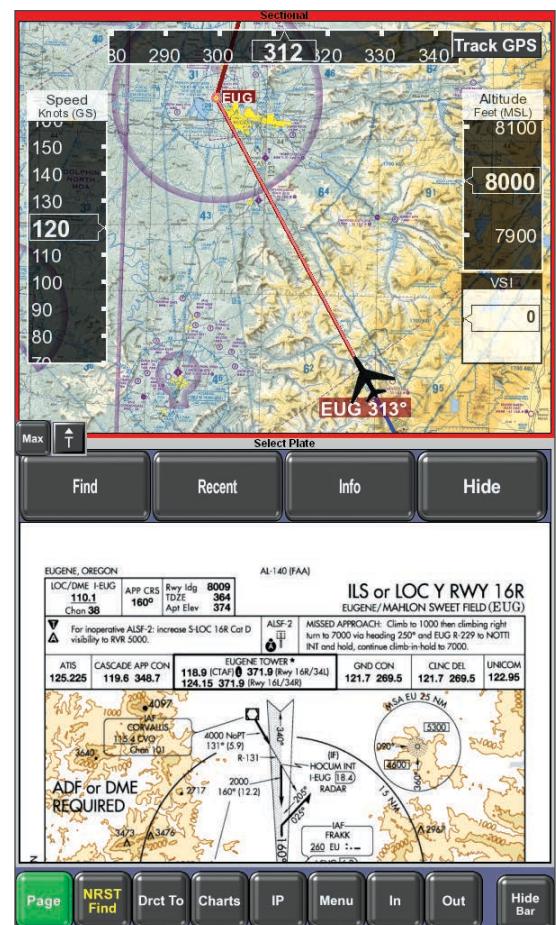
But whichever you choose, getting the other action to then happen (direct or viewing the plate) confounds the new user until you get at the logic of ChartCase's find function, which stores recent finds to access them later. You can also see approaches for airports within the range you have set on the map—powerful once you get it because you can pan and zoom

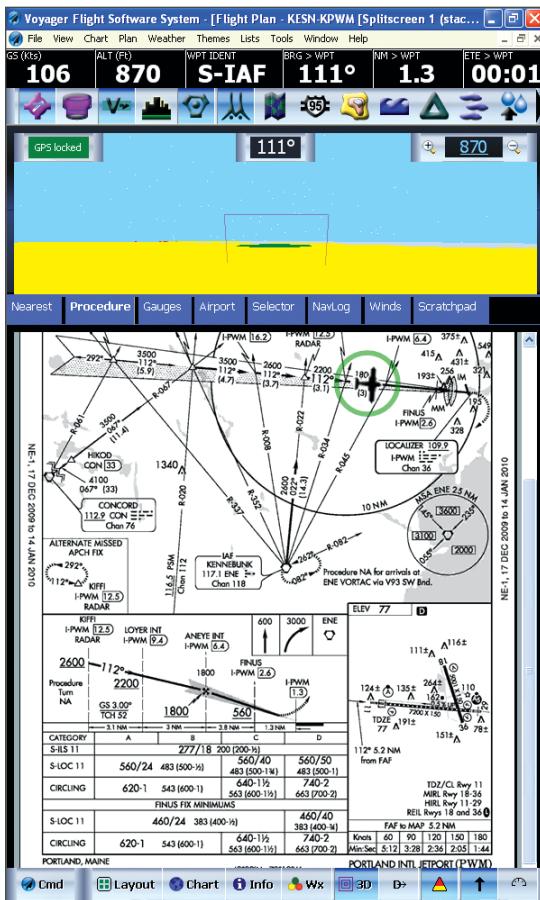
to narrow the list quickly, but not intuitive.

Once waypoints are in your flight plan, getting at any information is quick, but editing is one waypoint at a time. There is also no easy way to load the waypoints of an instrument approach into your flight plan, and there's no vertical navigation.

ChartCase's simplicity leads to some other limitations. Digging down to get airport frequencies or weather details—particularly for an airport not on your flight plan—is a more tap-intensive affair than other systems.

ChartCase has, in our opinion,





the best 3D representation with terrain warnings, and it works quite well with the airspeed/altitude/heading tapes. Weather display on the dedicated weather page is extensive, but it's limited on the basic navigation pages. They have new options for layering data in views for upcoming releases.

The hardware used for the ChartBook is a CTL 2Go NL1 Tablet PC. The beast was designed for children (which makes it a good choice for the abuse it's likely to get in the cockpit). ChartBook comes with either Windows XP or Windows 7. The touchscreen flips around so you can use a built-in keyboard for flight planning or checking your email in the FBO.

The ChartBook package starts at \$1795.99, which makes it the most expensive solution. XM weather and Zaon traffic with Bluetooth connectivity can be added for \$719.99 and \$1589.99, respectively.

FlightPrep offers a terrifically granular system for purchasing updates. Want

to buy the latest version of just one sectional chart? Fine, that's \$5 please. The full CONUS VFR and IFR charts (and approach plates) package is \$357/year. Data for the computer (vector) charts is free. The popular FlightGuide can be integrated into the airport info for ChartBook for an extra \$89/year.

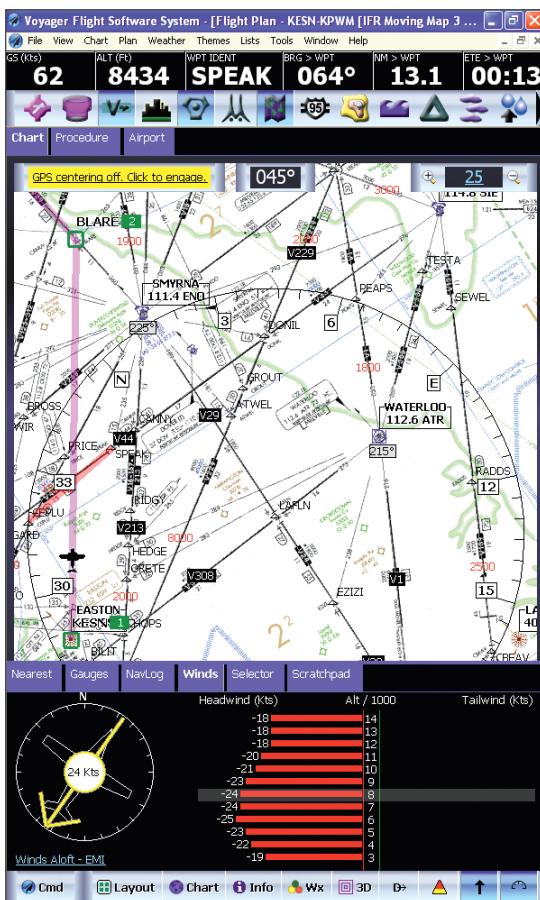
## VOYAGER SKYPAD

Seattle Avionics' Voyager was our top pick for both free and advanced flight planning on the desktop. But the cockpit environment is radically different. Voyager's flexibility and power that is an asset in the comfort of our den, we found to be a hindrance while we were also busy flying the airplane. Running Voyager on the Skypad is more like running a full-featured FMS than a source for charts and a moving map for situational awareness. That means lots of options and power, but a steeper learning and retention curve.

We're convinced that what Skypad does well, it does better than anyone else. Chief among these is access to data. On any of the systems, you can tap an airport on the vector map to get airport information. On the SkyPad, you can tap an airport on the *sectional* and get a pop-up. All the information is easily accessed through tabs—weather,

frequencies, approach plates, whatever—as well as options to go direct or insert it in your flight plan. On a trip from Maryland to Maine where we had the ChartBook and the SkyPad side-by-side performing the same tasks, there was no contest when it came to getting data and weather for an airport and working it into our flight plan. The SkyPad was easier and faster.

Sectional and IFR en route charts are stitched together so that you fly off one chart and onto another without noticing the border. You can layer weather, obstacles, terrain and much more on most of the charts. Rather than having separate windows for sectional



*Seattle Avionics' Skypad offers as many full-screen or split-screen views as you want. The software is by far the most feature-rich, but that doesn't equate to ease of use. On-screen buttons are, in our view, barely large enough to control with fingers. Skypad excels at finding waypoints, presenting airport information and weather, and editing on the fly.*



**RMS Vista's main page (far right) software does well for simplicity of navigation and clear obstacle and terrain warnings. You can quickly full-screen the main map to get rid of the Windows wrapper, but you lose some navigation buttons. The Flight Panel (near right) is a clever tool for quick reference of things like terrain or the bearing to nearby waypoints. It's customizable and toggles on and off from the toolbar.**

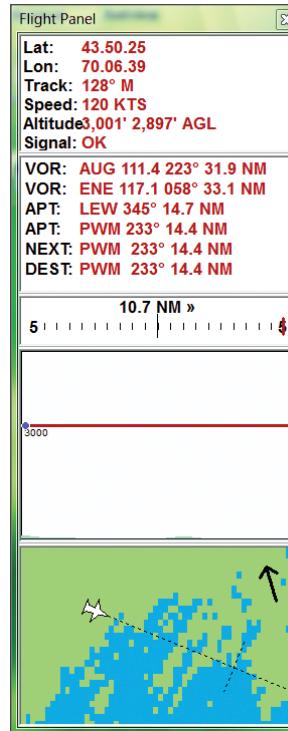
or vector charts, you can simply toggle the sectional on and off. In fact, this is the basic design of Voyager: You toggle data on and off as you want and can store presets of views you like as layouts. These can be full screen or split-screen. The split can be even sections or a custom division. You can also navigate by tabs for different views within a screen.

Voyager offers an interesting alternative to datalink weather. You can download weather via the internet before departing and have Voyager paint the weather as forecast for the current time as you fly. That won't help if weather doesn't develop as forecast, however.

The program offers FlightGuide data like ChartCase, but also offers fuel prices from 100LL.com and AOPA airport data (if you're a member). This can make a difference if you have an unexpected fuel stop.

Other features include a scratchpad on its own tab for jotting down a quick clearance (functional, but we still prefer paper for this) and a quick zoom to any scale. If Skypad sees you on the ground at an airport, it automatically shows an airport diagram. Obstacle warnings include bearing and relative altitude—a nice plus. There are also several hidden features. For example, tapping just the right spot on an approach plate pops up a list of all the other plates for that airport. Slick, if you remember where to tap.

We found SkyPad weakly optimized for fat fingers and we reverted to the stylus several times. The text size might also be a problem for older eyes. The ability to tap and get info on a scanned chart (like a sectional) makes panning across that same chart tricky. It takes some prac-

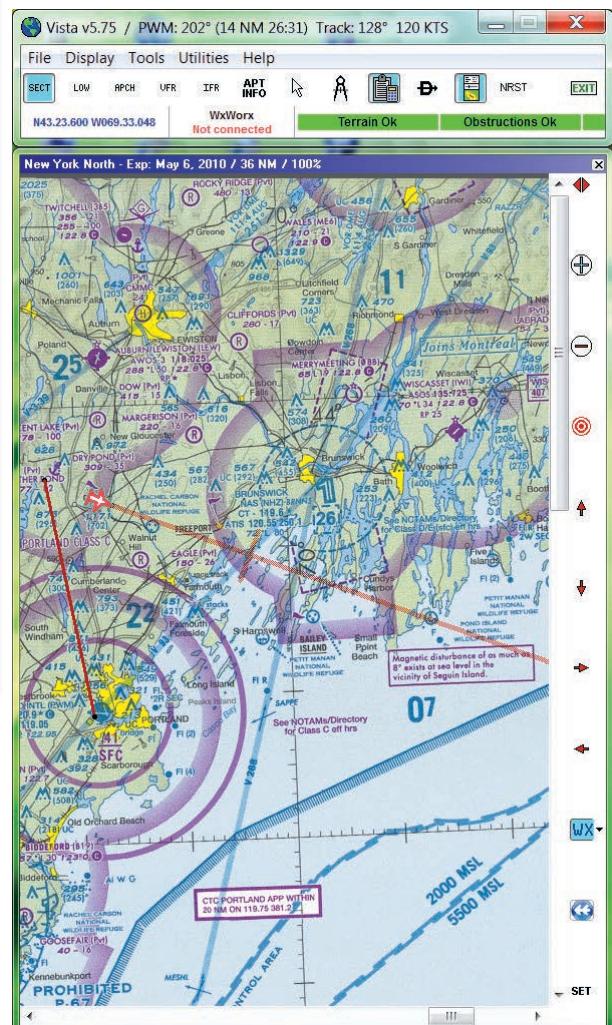


tice to get it right.

Getting the most out of several Voyager features takes practice. The direct-to function can be used like any direct to, but it also has power options for specifying a course or going direct to the nearest point on a specific airway. If you use these features regularly, they may make the SkyPad the best choice for you. But we think many users won't ever touch them. Another example of this might be the ability to add not only the final approach fix and glidepath to the runway to your flight plan, but actually add guidance into the downwind, base and final for a specific runway. It's a cute feature, but we think having your position marked on a moving map should be enough to get you in position for the appropriate downwind.

Voyager is processor-intensive and taxes the Tablet to its limit. Start-up is slow, in our view, and there can be a noticeable delay rendering some charts—sometimes so long we thought the computer had crashed. We learned to be patient.

The SkyPad lists for \$1095. It's an extra \$349 to get it with a solid state hard drive. This is essential if you fly over 10,000 feet. If you want XM weather with a SkyPad, it's a bit more than the others at \$695 for



Bluetooth. If you already have an XM receiver, there will be a \$199 fee for XM integration on the SkyPad. Data for the EFB (data, charts, approaches,) is \$299/year or \$829 for a lifetime subscription. You can also get smaller packages, such as just VFR data for \$99/year or \$297/lifetime. Flight Guide is an extra \$49/year.

*continued on page 32*

## CONTACTS

FlightPrep (ChartBook)  
800-966-4360  
[www.flighthprep.com](http://www.flighthprep.com)

RMS Technologies (Vista)  
800-533-3211  
[www.rmstek.com](http://www.rmstek.com)

Seattle Avionics (Skypad)  
425-806-0249  
[www.seattleavionics.com](http://www.seattleavionics.com)

# JPI EDM 730/830: Options for Tight Panels

*JPI's newest all-system engine monitors combine clever packaging with a full feature set. Leaning logic is especially sophisticated.*

by Marc Cook

**A**s we attempt to keep our legacy aircraft flying longer and more efficiently, more pilots look to the avionics upgrade path as a means of improving utility and safety. And while the glass-panel primary flight display and multifunction display have both earned their fair share of attention, it's also correct to suggest that the combined engine monitor—shorthand for a screen that includes powerplant and airframe system monitoring—is on many owners' radar. Who isn't eager to get rid of those wiggly needles, anyway?

J.P. Instruments has been a household name in add-on engine monitors, making popular the bar-graph style of EGT

and CHT monitoring. Many pilots are familiar with the firm's 2.25-inch gauges and while some of them can include monitoring of other engine parameters besides EGT and CHT, the limited display size reduces the number of items you can watch at once.

On another end of the market are those big-screen engine monitoring systems, such as JPI's own EDM-930 and EDM-960—both roughly radio-stack width and around 5 inches tall.

## RIGHT SIZE

But what if you're upgrading a panel and don't have that kind of open real estate? It makes sense to have an instrument in between those sizes, preferably one that fits into a 3.125-inch instrument hole—heck, you have a few of those to spare, right? Well, now there

## CHECKLIST

- + The 730/830 instruments slide right into a large instrument hole.
- + The can is offset and will rotate to clear obstacles behind the panel.
- + The monitor is easily configurable to use rich- or lean-of-peak engine operation.
- Only CHT, oil temperature and TIT are allowable replacement for OEM gauges.

is: The EDM-730/830 monitors are designed to slide right into a large instrument hole.

Sure, that's a great idea, but you haven't seen everything yet. The front of the instrument is rectangular—approximately 4.2 inches tall and 3.2 wide—with a 2-inch-deep stub on the back that fits into the instrument hole, similar to the way the Aspen Avionics EFIS takes two vertically stacked instrument holes.

Better yet, the stub is not centered on the instrument, meaning that the

*The EDM730 can be oriented in portrait mode (left) or landscape, below. Because the instrument is offset, it can be rotated to clear obstructions behind the panel.*



edge distance is different for each surface; in turn, this means that you can install the instrument with any of the four sides facing up, and the offset provides more opportunities to clear existing instruments or panel structure. To make that work, the screen can be configured, actually on the fly, to show the data in any of the four orientations.

So, what's it packing? It starts with all-cylinder CHT and EGT monitoring—either the 730 or the 830 can be configured for 4, 6, 7, 8 or 9-cylinder engines. What's more, the instrument is self-configuring. Plug in a new probe, and at power-up the instrument recognizes it and includes it in the scan.

The primary difference between the EDM-730 and 830 is the inclusion of manifold pressure and RPM sensors. With them, the 830 can also calculate percent of horsepower as long as there's also an outside-air temp probe connected. More on that later.

## SECONDARY INSTRUMENTS

The EDM can be tailored in terms of the layout and makeup of the secondary instruments. You can choose where any of the horizontal bar-graph displays reside on the 4-inch-diagonal TFT display, and set their upper and lower alarm limits.

The items the 730/830 can watch include oil pressure and temperature, fuel pressure and flow, turbine-inlet temp, carb temp, compressor-discharge temp and inlet-air temp. With a fuel-flow transducer, the instrument also performs the full collection of fuel-management functions, including real-time flow rate, time to empty, fuel remaining and fuel required to waypoint (with an external GPS feeding an RS-232 data stream).

More about the display. JPI has taken extra care to make the presentation clear and professional. If you have a four-cylinder installation, for example, you won't have to look at missing bars or blank spots on the display. Every item on the display is rendered to use all of the screen's area. A six-cylinder version simply

has the EGT/CHT bars packed more closely together. Also, the display is modified when you have a 730 versus the 830—the layout reorients to place useful data where the MP and RPM displays would be. In the vertical (portrait) layout, MP and RPM form the upper and lower halves of a circle, but when in the horizontal (landscape) mode, they split into two semicircles side by side, with large numeric displays below them.

A large single-line display just below the EGT/CHT bar-graph magnifies the values of other indications—you can scroll through the display's choices with the STEP button. If you have ever used a conventional JPI engine monitor, the 730's methodology will be immediately familiar.

Also on the front panel is the LF button, for Lean Find. In default mode, when you press LF once, the term ROP will appear, which means it's entering the Lean Find mode, expecting you to run the engine rich of peak EGT. (If you press and hold both buttons, you can select LOP for lean-of-peak operations; you can make this your default setting if you prefer.)

In Lean Find, the monitor watches the EGTs rise and notes the first and last to peak. Once it has found peak, the bottom display line changes to show the current fuel flow and the temperature delta from peak of the controlling cylinder, all as an aid to leaning. In the LOP mode, the EGT bars form an "icicle" layout, descending from the top line, to show how far each cylinder is lean of peak EGT.

The EDM-830, as mentioned, also features an engine-power calculator, and here it's done correctly: Rich of peak it uses mass airflow (manifold pressure x RPM, roughly), but lean of peak it uses fuel flow to calculate power. This attention to detail means that the calculation can be remarkably accurate without having to create intricate engine lookup maps.

How does it work? We had a chance to fly with Lance Turk, designer of the first all-in-one engine monitor, the Vision Microsystems VM-1000. He is currently flying the experimental version of this instrument, called the EDM-740, in his Glasair I.

## EASY ON THE EYES

Even cross-cockpit (Turk has the unit



*In portrait mode, the 730 packs all of the engine data into a single display, including fuel level and fuel flow and electrical monitoring.*

mounted in the small left subpanel) the 740's display is clear and legible right down to the smallest menu item. And while the individual bar-graph gauges do look alike, the ability to place them in any order allows each pilot to stack them in order of importance. You can also choose to leave a field blank, in effect creating a more prominent grouping for, say, oil pressure and fuel flow. In flight, fast-responding probes are worthy of mention—during the several engine-leaning cycles we tried, the EGTs



For an in-depth video on the new JPI engine monitors for experimental and certified aircraft, log on to our sister publication [www.avweb.com](http://www.avweb.com) and click the video button in the upper right of the home page. Scroll down to the JPI engine monitor video. Here's a direct link: <http://snipurl.com/ulni6>

## CONTACTS

JP Instruments  
800-345-4574  
[www.jpinstruments.com](http://www.jpinstruments.com)

# ULTRA'S NEW TWIN ENGINE MONITOR

Digital engine monitoring in twins has always been a design and technical challenge. The traditional solution has been to just install two discrete systems, one for the left engine and one for the right. It works, but it takes up a bunch of panel space.

Ultra Electronics Flightline Systems' new AuRACLE CRM2120 comes at the problem with a single-unit solution that incorporates the cutting-edge digital monitoring and color display technology it introduced in the AuRACLE 2100 single-engine monitor. (See the February 2007 issue for a complete review.)

A little housekeeping here: The AuRACLE series was developed by Xerion Avionix, a small, privately funded startup. The product line was purchased by Ultra Electronics in July 2009, which provided capital to complete work in the 2120 system, according to UE's Erick Hathaway. The 2120 is expected to be certified in time for EAA AirVenture, or shortly thereafter.

Like its single-engine progenitor, the 2120 is a modular system—the display itself lives in the panel while most of the processing and sensing goes on in boxes mounted to the firewall. There's an engine interface box for each engine and all of the sensors—CHT, EGT, fluid temperatures and so forth—run into those boxes, from whence they are routed into the display unit. Each engine interface has redundant processors to provide some comparative data checking.

The display is essentially a repackaged version of the single-engine units. The upper screen is the engine management area, the lower screen contains ancillary engine gauges including fuel gauges, oil temperature and pressure, amps, volts and vacuum.

These gauges, while not necessarily engine critical, are also more than nice-to-have add-on since in order to fit into the panel, the

CRM2120 has to replace the existing analog gauges. Hathaway says it will have the approvals to do this.

For the time being, STC/AMELs are planned for the 300 and 400 series Cessnas, Barons and later model Senecas. Other approvals may come along later.

In order to make this work, the CRM2120 will be available in a vertical or a horizontal format.

In the vertical version, it replaces the 2 1/4-inch gauges in later Barons and Senecas. The horizontal version is for pre-1984 Barons and Cessna 300 and 400 panels. Overall screen dimensions are 5 inches wide by 8 inches tall for the vertical version and 9 3/4 by 4 1/2 inches for the horizontal style.

The original AuRACLE pioneered something called "Smart Leaning" which allows leaning from either the rich or lean side of peak and includes text annunciations and warning flags for critical engine parameters.

The CRM2120 allows a degree of customization. You can, for instance, program it to show yellow bands at certain fuel levels or to flag CHTs cooler than the certification limits.

For maintenance and diagnostics, the monitor records engine parameters every two seconds for a total of up to 100 hours per engine. It also ingests GPS data, so it should be possible to discern phase of flight from the stored data. Price on the CRM2120 is expected to be \$14,000. For more, see [www.ultrafei.com](http://www.ultrafei.com).

immediately followed movement of the mixture control, and the Lean Find function looked stable and easily digestible to a pilot who is busy doing other things (like flying). And while we didn't have the chance to validate the percent-of-power readings, they definitely passed the sniff test based on our understanding of the Lycoming O-320.

And those who want to track engine health will be excited to learn that the 740 includes integral data logging—it can absorb data at 6-second intervals for some 200 hours. Access to the data comes from a front-panel USB port. Plug in your USB stick, press a few buttons, and the stored data goes rushing out. We watched a download, and can say that the new USB hardware is dramatically faster than the serial-based transfer on the older EDMs.

Installation should not be back-breaking, especially if you already have a JPI engine monitor. The harnesses are exactly the same, as are the probes. In theory, this could be a plug-and-play with a later-model EDM-700 or 800. At the moment, the EDM-730/830 are approved

as primary replacements for CHT, oil temp and TIT, meaning that those stock instruments can be removed.

Prices are competitive. A basic EDM-730-4 (four-cylinder) is \$1995, and \$2750 for the six-cylinder version. Step up to the EDM-830, which includes the MP/RPM sensors, fuel flow, oil temperature and pressure probes, for \$3795; it's \$4295 for the six.

That's approximately \$500 more than the old price of the EDM-700/800 series. J.P. Instruments has, in our view, greatly expanded the capabilities of the small-format engine monitor in the EDM-730 and 830, packing a lot of capability into a clever, compact package.

*Marc Cook is editor of Aviation Consumer's sister publication, KITPLANES.*



# Kneeboards: Sporty's Classics, ASA Top Picks

*ASA's folding lapboard surprised us with its versatility and comfort. For strap-down kneeboards, Sporty's line did simple to complex with ease.*

by Jeff Van West

**E**ven in this age of cockpit electronic, there's often a need to jot something down, hold open a chart or approach plate, or stow your checklist. Enter the kneeboard, and the reviewer's dilemma.

Kneeboard needs and preferences vary not only person-to-person, but even aircraft-to-aircraft. So here's the

best in class as we see it from several perspectives.

## ONE PAD, ONE PEN

The core function of a kneeboard is to write stuff down. With strictly that goal in mind, we liked the Classic VFR and Classic IFR kneeboards from Sporty's.

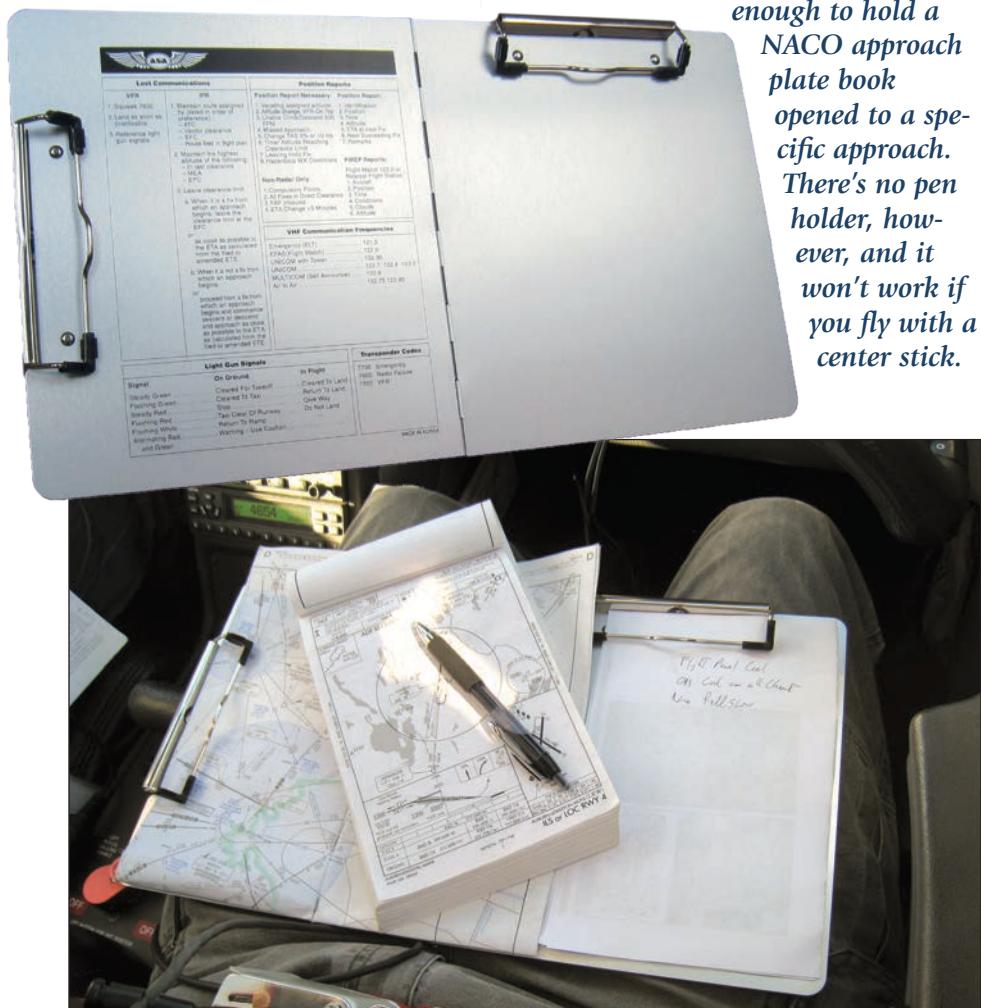
*Simple is good, and Sporty's Classic VFR and IFR boards (below left) are as simple as you get: board, strap, clip and pen holder. The quick-release pen holder is largely why we think this specific design takes top prize. The Flyboys basic kneeboard (below right) was comfortable and compact, with a strap that easily held an approach plate book. The custom*





**Who says your thighs have to have all the fun? The ArmBoard (above) straps to your wrist and has a holder for your pen. The pads come blank, ruled or with a nav log form. The location is convenient and it doesn't interfere with flying, however, we found it less comfortable than a kneeboard after an hour of wear. The pen holder was too small for fat pens as well. ASA's lapboard (below) doesn't connect to an extremity, but it stays in place just fine due to its size. It proved the most convenient for juggling several items and the most comfortable. The left-hand clip opens wide enough to hold a**

**NACO approach plate book opened to a specific approach. There's no pen holder, however, and it won't work if you fly with a center stick.**



a clip. We liked the clip better as it's quicker to use and holds most any size pen, but if you like the sleeve, go with ASA. Both hold half-letter (5.5-by 8.5-inch) pads.

Sporty's board has foam anti-slide material on the back, but it's superfluous if you use the strap. Our experience with that foam is that it usually wears out and disintegrates over time anyway. The board can hold a pack of approach plates under the clip, but it's awkward and tends to make the paper underneath fall out. You'll want a separate holder for a book of plates (see below) or a kneeboard that's a bit more feature-rich to hold a bound book of approach plates.

That kneeboard might be the Flyboys Kneeboard. This design adds a small side section with three pen holders that accept all but the beefiest pens. There's also a small pocket OK for a pulse oximeter or pack of mints.

The big added feature is a clear strap that comes across the entire board to hold down a pack of plates opened to the page in question. The grip is quick and secure, and the text under the strap is perfectly readable. The downside is that the placement makes writing on, or looking at, the paper underneath a hassle. The Flyboys system also offers a set of checklist rings on the left side of the kneeboard for any checklists or quick-reference items you might want to add.

If you need more storage from your kneeboard, such as folded charts or sticky notes to cover the attitude indicator during instrument instruction, then the Sporty's Flight Gear Tri-Fold Kneeboard is a best bet. The \$27.95 price is lower than similar kneeboards by other vendors and, we think, the design is more versatile with a good combination of long chart pockets and square mesh pockets.

## KNEEBOARD ALTERNATIVES

Our favorite kneeboard wasn't exactly a kneeboard at all. It was ASA's Lapboard. This is really just a piece of bifold aluminum with a clip on the top of the right section and the side of the left section. Resting in our lap, it made a surprisingly comfortable and versatile workspace to have charts, plates and a pad. The best

**Both Sporty's and ASA offer long, tri-fold kneeboards that can carry sectional and en route charts without folding. We favored Sporty's design with the mesh pockets on the left. One of our staff uses this Sporty's board as his portable flying office.**

part was just tossing something down and having it stay there until we needed it again. The experience was like having, well, a desk.

Charts or an approach plate book can be clipped or rested on the left with room to write on the right. When it comes time to land, the whole thing can be folded and put aside far easier than a big kneeboard, which always seems slightly in the way on landing. The only thing we wished for was a good pen holder.

Just by chance, we were also flying with two cockpit EFBs for the accompanying article in this issue. The Lapboard with a cloth pad resting on it turned out to be the perfect resting place for the rather large and heavy EFB computer. We liked this better than yokemounts (which tend to be cumbersome with something so big as an EFB) but not quite as well as a good suction mount which could hold the EFB at eye level.

ASA's Lapboard sells for \$29.95. Sporty's sells what looks like the same product (although we didn't have one to test) for less, at \$21.95. It has the anti-skid grip stuff on the bottom and ASA doesn't, but we didn't have any issue with ASA's sliding.

If you're using a simple kneeboard and still need a place to strap your approach plates, you can get a clear Chart Leg Strap from [www.tagpilot-supply.com](http://www.tagpilot-supply.com) for \$6.95. A similar product is also available in two widths from [www.flywings.com](http://www.flywings.com) for a bit more. It does start to feel like you're wearing football padding with multiple things strapped to your legs, but the simple chart strap works great.



If all you need is somewhere to write, it doesn't have to be on your knee. The ArmBoard is available through several online outlets (\$24.95 from Sporty's) and puts the writing on your wrist. The Armboard takes custom pads, which can be had for \$6-7 for a pack of three.

We found the freedom of not having stuff in our laps refreshing, but felt the ergonomics of writing on your inner wrist awkward if that arm was also flying. It quite comfortable if the airplane was on autopilot and we could bring our arm closer in and at a better angle. The pen holder sleeve for the ArmBoard also didn't like fatter pens.

### DON'T YOU ZULU?

We've briefly used the Zuluboard kneeboards in the past and been impressed by their comfort and utility packed in a small space. They are similar in design to the Flyboys kneeboard, but without the approach-book strap and with more options for pens and other small items. They also offer a unique tabbed system of "Zulucards" as basic checklists or memory items for different phases of flight.

Unfortunately, the company was unresponsive to our emails or phone calls to get samples of their products for this review. We had similar difficulty with the company during our flight bag review. The company website is still active and says you can order the boards, at prices ranging from \$24.95 for the Economy Mini-Z

to \$59.95 for the Deluxe Zuluboard. If you can get a hold of one to try out in person, it might be worth a look before you commit to another option, but that's about all we can say about Zulu at this point.

This is far from everything out there, but, frankly, we haven't seen anything fancier that held our attention for long. (Although a kneeboard specifically designed for the left-handed pilot with its extra flap on the left is definitely lacking.) When it comes to old-school, pen-and-paper technology, we think that simple and well-made is the way to go.

*Jeff Van West is Aviation Consumer's Managing Editor and resident kneeboard addict.*

## CONTACTS

ASA  
800-272-2359  
[www.asa2fly.com](http://www.asa2fly.com)

Flyboys  
888-435-9269  
[www.flyboys.com](http://www.flyboys.com)

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

Zuluworks  
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## Bargain Retractables:

*Now's a great time to buy a retractable single. Piper's Arrow is the best bang for the buck.*

By Joseph E. (Jeb) Burnside

Now's a good time to buy a used airplane. Savvy buyers can snap up pretty much whatever they want, paying as little as 50 percent of what the same plane might have gone for only three or four years ago. But what to buy? Our answer always has been the right airplane for you is the right airplane for your mission. For many of us, that means a four-seater capable of cruising at around 130 knots for four hours—plus IFR reserves—and enough payload to reasonably haul four adults and bags, even if we need to offload some fuel. So, we're basically talking a retractable single.

The good news is there are a lot of

them from which to choose. The bad news? Even in this market, finding the right bargain will still take some work. To try making that process easier for you, we set an arbitrary price of \$60,000 and, with a fresh copy of the *Aircraft Bluebook Price Digest* in hand, looked at what's available and what you can expect. We found the best bargain is the Piper Arrow IV, but many other models may merit your attention, especially if you have some special needs or desires.

### CAVEATS

With the economy in the tank and some desperate sellers cutting prices well below average, it's definitely a

*As retractables go, Piper's Arrow offers a high-value combination of good price, supportability, ease of operation and middling performance.*

buyer's market. Which means it's probably not a good idea to jump on the first "deal" you come across. Instead, spend some time watching *Trade-A-Plane* and other resources for those airframes that seem reasonably priced but which haven't sold. Then, since there's usually a good reason an airplane hasn't sold if it's priced right, ignore them.

At the same time, think carefully about what you might be getting into. For example, some of the models averaging \$60,000 these days are 50 or more years old. While age alone wouldn't deter us from a well-maintained example, buying and operating what is essentially a vintage airplane isn't for the faint of heart. Or wallet. Even a creampuff example might require a couple of years and several trips to the shop to get it sorted out the way you want. And if you find some corrosion missed on your pre-purchase inspection, your \$60K bargain easily could turn into an \$80,000 albatross.

Also, the very idea of buying a retract may not be the best one for you. That same \$60,000 can get you into a mid-1970s Skylane or slightly older Cherokee 235, which will meet all of our basic criteria without the maintenance or insurance expense of retractable landing gear.

Avionics is another area where you may find "average" isn't what you had in mind. The *Bluebook* prices we used in evaluating this market, for example, may not include a moving-map GPS or autopilot, something we consider standard equipment in an airplane used for traveling. We generally urge shoppers to find an airplane with all the goodies they want already in the panel, since adding them yourself costs more than buying them already installed. When looking for one of these bargain retracts already equipped with all the goodies you want, expect the price to



*Straight-tail Bonanzas like the 1967 E-33 above are good performers for the money and are still supportable. The 1959 Comanche 250, upper right, retails in the mid 40s and owners rave about them. Although J-model Mooneys aren't cheap, the pre-201 Fs, like the one at quite affordable at under \$60,000 for a good example.*

*Jeb Burnside is Editor-In-Chief of sister publication *Aviation Safety magazine*.*

go above \$60,000, or the aircraft to be older.

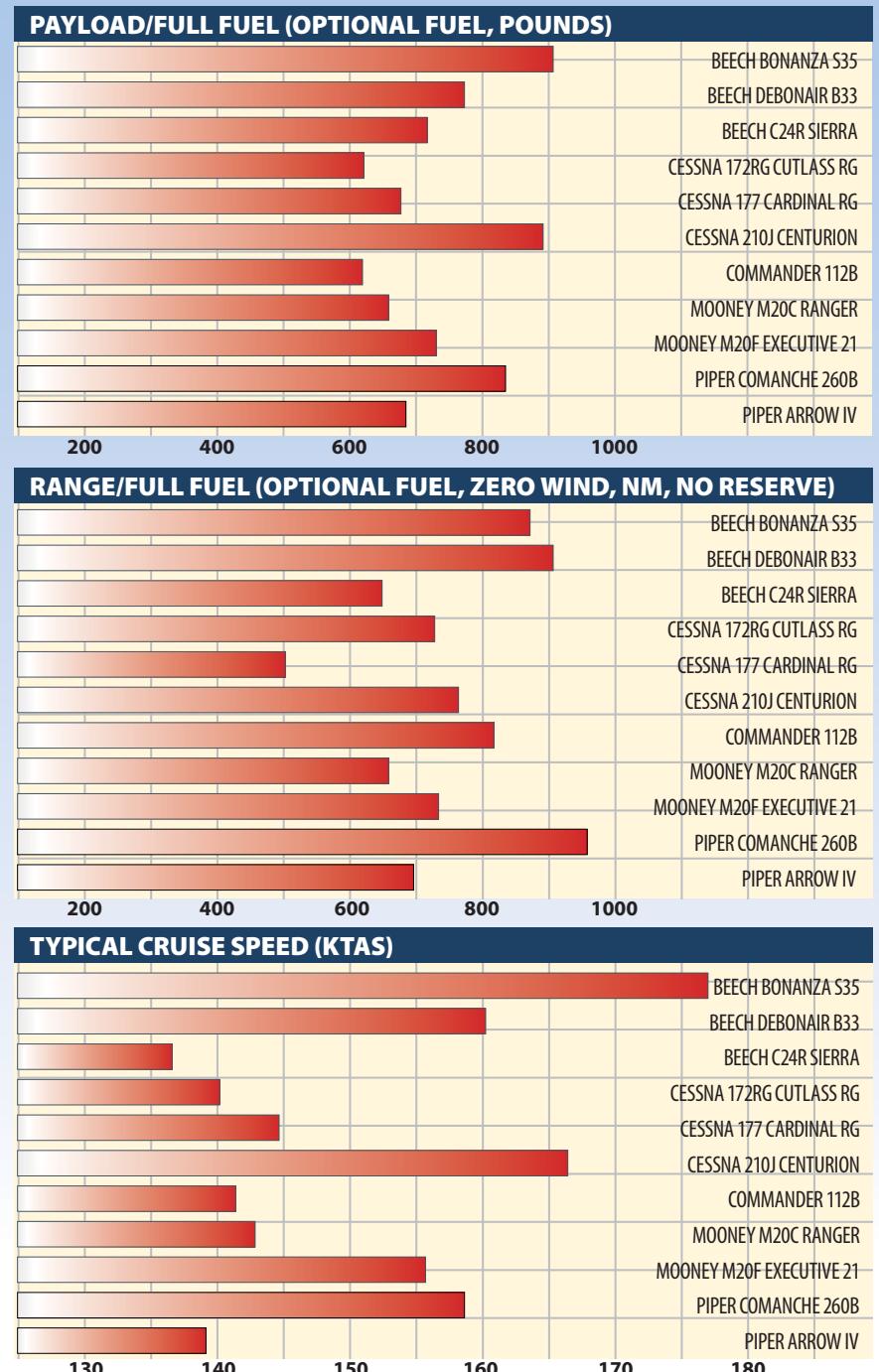
Finally, with two basic exceptions—the Piper Arrow and the two Mooney models we'll get to in a moment—all of these airplanes are out of production. While for the most part their respective factories still support them, what about five or 10 years from now? How good are you or your mechanic at scrounging parts or finding someone to rebuild what you have?

## BEECHCRAFT

The last V-tail Model 35 Bonanza flew away from the Beech factory in 1982. Twelve years later, the company rolled out its final copy of the Model 33, or straight-tail Bonanza, after introducing it in 1960 as the Debonair. Together, these two models also may be thought of as "short-body" Bonanzas, in deference to the lengthier Model 36, which remains in production. For your \$60,000, you should easily be able to find either a 33 or 35 from the mid-1960s. If something newer is more your cup of tea, the last few editions of the Model 24 Sierra, known as the C24R, which went out of production in 1983, can be had for only \$45,000. But caveats apply to all these choices. For example, Beech has long been known for expensive and no-longer-produced parts. The reality is a little different.

Beech has a deserved reputation for building stout aircraft. Unless an example has been poorly maintained or suffered damage, the vast majority of consumable parts are industry-standard items or something a speciality shop can overhaul. There are exceptions involving Beech's use of magnesium in control surfaces, for example, but even those components can be rebuilt, for a price. Powerplants in older Bonanzas can range from the ancient E-series Continentals to a fire-breathing IO-550 and everything in between.

Meanwhile, the short-body Bonanzas tend toward Dutch rolls in turbulence. Some of this results from its flat-bottomed and slab-sided fuselage, which doesn't do much to damp such tendencies, and some of it involves the type's interconnected rudder and aileron system. Pilots experienced with the Bonanza know some slight pressure on the rudder



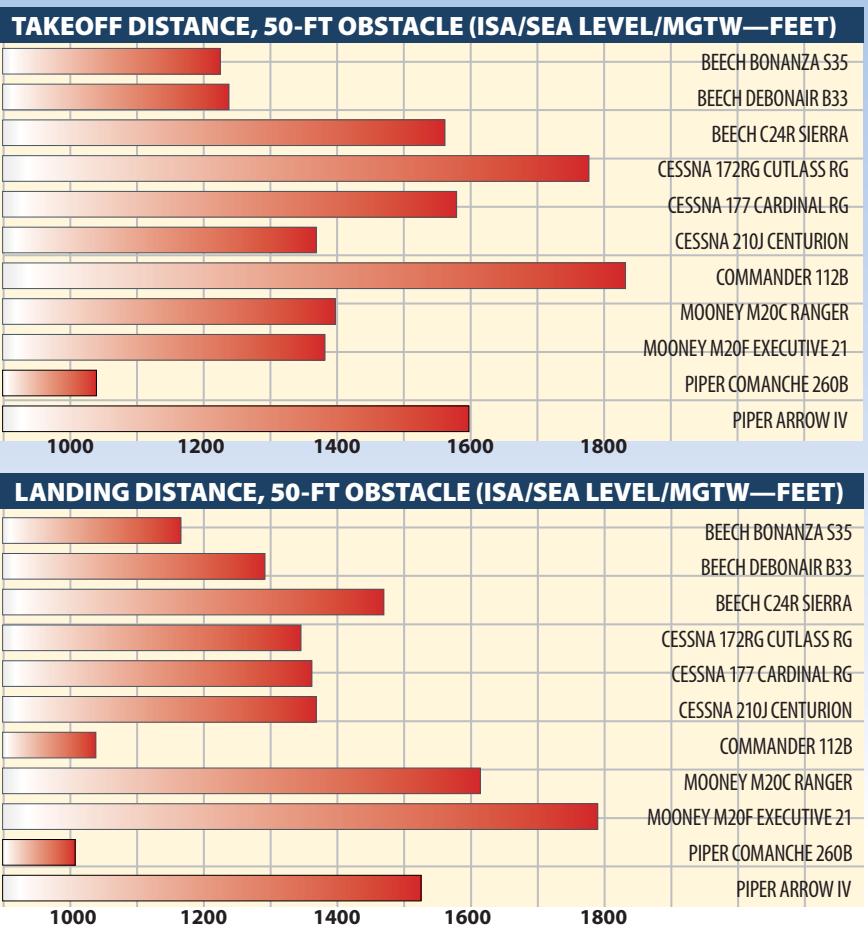
pedals helps damp any Dutch roll. Those same pilots agree flying the Bonanza is a delight, with well-harmonized controls and excellent performance.

The same can't always be said of the Model 24 Sierra, Beech's answer to Piper's Arrow. The Sierra is basically a retractable Musketeer, itself an attempt to compete against Cherokees and Skyhawks, which came on the market in 1963. The first Sierras were marketed in 1970 and offered relatively spacious cabins, at least

when compared to the competition, plus substantial load-hauling ability. Later versions of the Sierra came with two front-row doors, plus a third one for loading the aft cabin and baggage area. In keeping with Beech's reputation, the Sierra is well-built and a delight to fly. It's also the only 200-HP retract of which we're aware capable of seating six, even if the last two need to be children.

## CESSNA

Cessna's single-engine retractables all



suffer from the same basic malady: Trying to fold into the fuselage landing gear other manufacturers stow in the wing. Starting with the earliest 210s, the basic design has depended on sometimes-leaky hydraulics, crack-prone saddles, balky gear doors and an assortment of other problems, depending on model and year of manufacture. Thankfully, the gear systems in the 172RG, 177RG and 210 have been out there long enough for redesigns (210) and upgraded components (172RG/177RG). Still, the system can be maintenance-intensive and, if the hydraulic system leaks all its fluid, the gear simply won't come down on its own.

If you already have your complex airplane endorsement, chances are you earned it in either a Cutlass RG or a Piper Arrow. Although the Cutlass RG basically replaced the Cardinal RG as Cessna's entry-level retract, they are two very different airplanes, with the Cutlass' 172 heritage readily apparent. That's not necessarily a bad thing, especially

if the basic Skyhawk cabin fits your needs but you just need more speed. With its bulletproof engine, the 172RG might be an excellent choice if you can find one that hasn't been abused by renters.

The Cardinal RG, on the other hand, was rarely seen on the flight training ramp. Featuring a fuel-injected version of the same basic Lycoming 360-cube engine as installed in the 172RG, the 177RG is more of a baby Centurion than it is a Skyhawk on steroids. It comes with a much larger, more-comfortable cabin, a cantilever wing and a stabilator. Huge cabin doors facilitate access, but also can get caught in the wind and break their hinges. The wing is mounted further aft than the Skyhawk's, so a pilot can actually see what's above by leaning forward.

The Centurion, meanwhile, started life as a retractable 182 with a 260-HP IO-470 and weighing only 2900 pounds. Over the years, it's changed quite a bit, morphing into a pressurized, turbocharged, 325-HP,

4100-pound business machine. In contrast, the earlier 210s were much simpler airplanes—except for the landing gear, perhaps—and soldier on in a variety of roles. Seating for six is standard beginning with the 1964 210D model, although the early rear-most seats are for children. The struts were eliminated in 1967 in favor of a cantilever wing, which remained throughout production.

## COMMANDER

First certificated in 1972, the Rockwell Commander 112 emphasized looks, cabin room and comfort over raw performance. Two upgrades later, the 112B sported 16-inch wing extensions and a more-respectable 1027-pound useful load. Never known as a speedster, the 112 trades wide-body cabin comfort for leisurely cruise speeds. Perhaps because of its military-airplane experience, Rockwell built into the 112 numerous "big-airplane" features, including a stout landing-gear system along with well-engineered ventilation, electrical and fuel systems.

Original production ceased in 1979, and the design has been through a variety of hands—including a well-heeled group of pilots—with a potential new owner in the wings as we write this. That group was formed to produce parts, among other reasons, and owners report no problems in maintaining their 112s, which always is a concern with older aircraft.

The type's history has been marred, however, by a rash of airworthiness directives (ADs) targeting wing-spar cracking, plus cracks in the tail's vertical spar. A 1990 AD called for repetitive inspections until modifications could be performed. The good news is no additional ADs against the basic airplane have been issued since then. As for the ADs, most aircraft in the fleet probably have been modified and what's required to rework the rest is well-understood.

## MOONEY

Any time pilots discuss the most-efficient personal airplanes, Mooneys invariably are part of the conversation. Although perhaps the most

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**CESSNA R172K Hawk XP**

**DESCRIPTION**  
Engines: 195-HP Continental IO-360-K  
TBO: 2000 hours Overhaul cost: \$16,500  
Prop: 2-bladed, constant-speed  
Gear: Fixed tricycle, oleo nose  
Fuel: \$2.68/gallons

**NOTES:** Specs are for 1979-up models, where longer TBO

**WEIGHTS & DIMENSIONS**  
Length: 27' 7" Width: 10' 1" Height: 8' 10" Wing Span: 35' 10"  
Empty Weight: 1590 lbs.  
Gross Weight: 2595 lbs.  
Payload w/full std. fuel: 666 lbs.  
Power rating: 13.08 HP/lb

**PERFORMANCE**  
Maximum speed: 132 knots  
Cruise: 130 knots  
Vne: 47 knots  
Maximum climb: 870 FPM  
Service ceiling: 17,000 feet  
Takeoff roll: 800 feet  
Takes off in: 1,300 feet  
Landing distance: 50 ft. 1345 feet  
Landing roll: 635 feet  
Max range: VFR res., std. fuel: 570 miles

**PRICING**  
1981 R172 Hawk XP (\$78,000)  
1979 R172 Hawk XP (\$62,000)  
1977 R172 (18) Archer (\$59,500)  
1972 Cessna 172 Cardinal (\$59,000)  
1966 Mo 20 (\$35,000)  
1949 Beech 24 (\$20,000)

**PRICES COMPARED**  
\$10,000      \$30,000

**SELECTED DATA**  
97-26-17, Ultralight crank case  
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# Autopilot Odyssey: Success Took Three Tries

*A nightmare experience with an autopilot upgrade shows that competition in the market is virtually extinct. Consider that when buying a used airplane.*

by Ken Sutton

**G**iven the slide in the value of used aircraft, there are some real deals on the market these days. But there are also some huge pitfalls and one of the most potentially expensive is underestimating the replacement cost of an autopilot system. *Aviation Consumer* avionics editor Larry Anglisano wrote about this in the March 2008 issue and I now wish I'd read his advice earlier.

In this article, I'll show an actual

**Installing a modern autopilot system once, much less three times, involves major surgery and significant structural work and rewiring. Author's Cessna 310 panel was stripped back to the firewall and completely reconstructed.**

example of how an autopilot upgrade project can neutralize a good deal on a used airplane. My adventure began in early 2003 after the birth of our third child. We had outgrown our Bonanza and it was time to search for an airplane with more room and greater payload.

Living northwest of Chicago, I wanted an airplane that I could comfortably fly across Lake Michigan and that meant a light twin. As I was about to learn the hard way, step number 1 in searching for an airplane should always consider the autopilot first, if your operations will require one.

## LOW-TIME 310

After a lengthy search, I found a low-time Cessna 310 G-model (1962) owned by a former radio celebrity

## CHECKLIST



S-TEC appears to be back on its game with its product line and customer support.



When shopping for an aircraft with an autopilot, make sure what's in the airframe is still supportable.



Chelton gets a nod for buying back the customers autopilot when it exited the business.



Although it had an autopilot for the 310, Century did poorly with support.

in Denver. I flew out to Denver and spent the next week with the local Cessna dealer as they performed a thorough pre-buy inspection. I was focused on the airframe and engines and naively gave little consideration to the autopilot. I was aware that the panel was dated and ripe for an upgrade, but I believed I could readily bring the avionics—including the autopilot—into the 21st century.

My first experience with the existing Century II autopilot came on the flight home from Denver. Without a pitch mode, the Century did a fine job tracking the airways and I was able to trim the airplane to hold altitude with minimum manual effort.

While I expended a great deal of resources upgrading mechanical systems after I brought the airplane home, it wasn't long before avionics upgrades reached the top of my to-do list. At the time, UPSAT had just received FAA approval for the first GPS WAAS navigator and knowing I'd be frequently flying IFR into my home airport where there are no precision approaches, the CNX80 became my first avionics purchase.

The CNX80's features were intuitive, largely mimicking the FMS and FMGS systems I was accustomed to at the airline where I worked. However, flying the CNX80 coupled to the pitchless Century II autopilot, particularly for VNAV or LPV approaches, seemed absurd. I knew



the next logical step would require a significant commitment. For the next two months, I worked with both Mike Voltl, owner of Mobile Avionics and Jim Finefield, owner of Finefield Aviation at Lake in the Hills airport to formulate a plan for a major avionics upgrade to my 310.

Chelton had just introduced their revolutionary two-servo digital AP3C autopilot to the market. My decision to install this autopilot came after I saw it coupled to a CNX80 in Chelton's demo aircraft. With only two servos, rather than the conventional three, the AP3C autopilot was capable of smoothly flying an LPV or RNAV approach with CNX80 guidance. This was exactly the capability I was looking for.

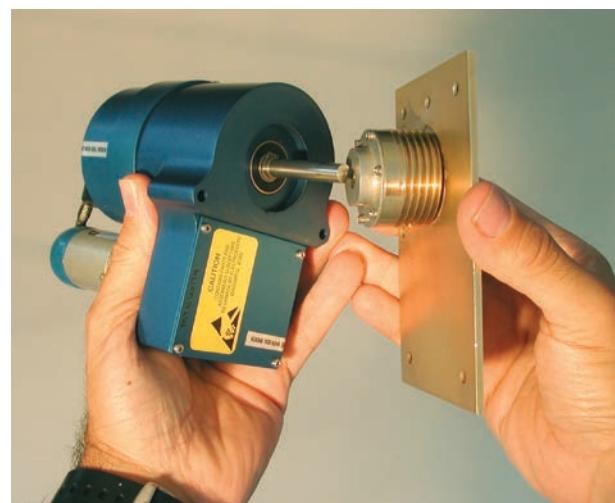
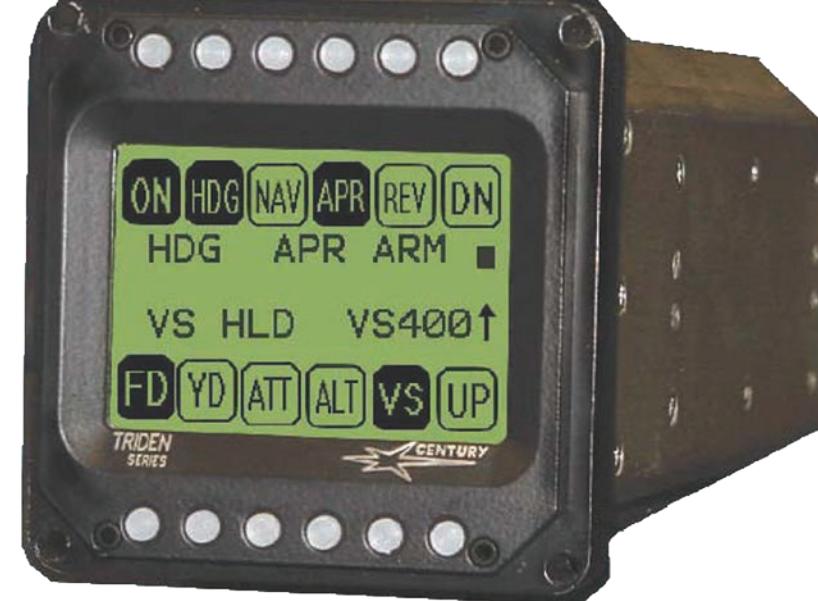
The original panel was removed along with all the old wiring, hoses, switches and circuit breakers. With Jim Finefield's help, the panel was crafted to mimic the jet aircraft style I was familiar with in the pre-EFIS Boeings I flew. Engine instruments were stacked in left/right columns just to the right of the standard T-layout for the flight instruments. Electronics International gauges and engine monitors helped preserve panel space and provided the layout I wanted.

The AP3C autopilot control panel fit nicely into the avionics stack just below the CNX-80. The refurbishment of the panel was remarkable, albeit with great effort by the installation team. The performance of the system was satisfactory after only some minor tweaks. Chelton provided good customer support before, during and after the installation. I was pleased with what we had accomplished and the AP3C performed well. Unfortunately, that wasn't the end of it. Not by a long stretch.

## CHELTON EXITS

Just six months after we upgraded the panel and installed the AP3C autopilot system, I received a call from a representative at Wulfsberg Electronics, a Chelton sister company in the Cobham plc family. I was told that Chelton had exited the autopilot business and I was offered two choices: Either they would buy back the autopilot system I had just installed, fully reimbursing me for the components, the installation and

*Century's Triden, right, is the digital follow-up to its popular attitude based systems. However, in author's 310, the system proved unreliable. Chelton's AP3C used innovative, high-quality servos, center photo, but the company yanked the system from the market just before buying S-TEC. The System 60, lower photo, ultimately proved the winner.*

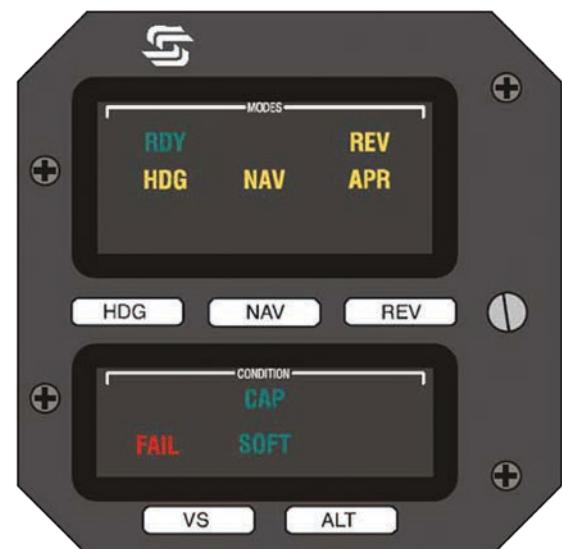


the removal of the system, or I could choose to do nothing.

However, I was warned that future support for the system was "uncertain." I was given 20 days to make a decision. In effect, I was offered only one logical choice. With the help of Mobile Avionics, we elected to remove the AP3C system and return it to Wulfsberg.

With the benefit of hindsight, it's not difficult to connect the dots and understand what was going on in the GA autopilot business at that time. I suspect without coincidence that Cobham pulled the plug on its AP3C autopilot just months before acquiring S-TEC. After we removed the AP3C from my airplane, I could not find a single S-TEC dealer that would agree to install their system. S-TEC was in turmoil and their dealers weren't happy.

Century Flight Systems had recently rolled out their first attempt at a fully digital autopilot, similar in capability to the AP3C which



they called the Triden. I had met the president of Century at Oshkosh just a few months earlier and he raved about the new system's capability. However, when I inquired with sources inside the industry, I received discouraging reviews about the company.

While Century has been around



*Although it wasn't to last, the addition of the Chelton autopilot, top photo, made for a spare and organized panel in the 310. Note the L/R digital engine gauge packages. The ultimate solution, lower photo, has a pair of Aspen EFDs, bringing a 48-year-old panel into the 21st century. S-TEC System 60 control unit is installed on the pilot-side subpanel, just behind the yoke.*



for many years, ownership changed several years ago and the company is today but a small shadow of what it had once been in its OEM-supplier glory days. Factory support was consistently described by some of these sources as wanting. Unfortunately, the Bendix/King KFC autopilot line was not STC'd for my airplane, S-TEC was still uncertain and so

## CENTURY'S VIEW

We contacted Century Flight Systems for its view on the author's autopilot foibles. Century's Bill Eubanks told us that although he recalled Sutton's airplane, he did not recall the details of why the autopilot couldn't be made to work. He told us he was unaware of whether the Trident system had been installed in any other Cessna 310s.

Century's largest seller remains the Century 2000 autopilot, according to Eubanks. The Trident is considered a specialty, low-volume product.

The installation of the Century Trident autopilot included a new Century NSD1000 HSI, a new flight director gyro, the altitude pre-select system, a yaw damper and, to add panel space, a Garmin GTX33 remote transponder. The CNX80 was upgraded to a Garmin GNS480 and a Shadin fuel totalizer was added. On paper, this seemed to be another leap forward in avionics and autoflight capability, but the reality turned out to be sadly disappointing.

For the next two years the airplane's reliability fell to near zero. After we installed the Century system, I was unable to complete even one flight segment without a Century autopilot component failure. On one flight, the Trident controller unit internally burned while airborne, creating smoke in the cabin.

The Century attitude gyro tumbled in flight twice, including once in actual IFR conditions. For still undetermined reasons, the autopilot would initiate uncommanded rolls to the left and right up to 25-degrees. When the backlighting rheostat for the autopilot controller was turned up, the autopilot would

command a sharp pitch up and when the rheostat was turned down, the aircraft would abruptly pitch down.

I found that communicating with Century and its repair technicians was difficult and this seems to discourage a feedback loop by which valuable information can be efficiently conveyed. Components were being shipped to and from their headquarters in Mineral Wells, Texas, weekly.

Test flight after test flight proved the system to be unreliable and unstable. There was a standing joke with my installation team that we should have installed the system with Velcro to make it easier to remove the components as they failed.

In an attempt to gain control of what was rapidly turning into an untenable situation, I arranged to take the airplane to Century's headquarters at my own expense for a week-long examination of the system. After I clearly demonstrated in a test flight the problems that continued to plague the system, Century was unable to pinpoint the cause. After a week of inaction, I flew home and made the painful decision to remove the Century autopilot and find yet a fourth autopilot for my airplane. I was hopeful I could find one that would not have a propensity to catch on fire in flight.

## ROUND THREE

Bruised, battered, but not yet beaten, Mobile Avionics patiently went about the process of removing the Century autopilot. At one point, I contemplated selling the airplane and giving up on general aviation entirely. Fortunately, by this time, Cobham plc, Chelton's parent company, had purchased S-TEC, providing much needed capital to refresh the brand and the company's image with dealers.

With new life now pumped back into S-TEC, several dealers I spoke with were once again recommending the S-TEC product. While S-TEC's flagship 55X autopilot is not approved for my model 310, an STC exists for their Model 60-2 autopilot. Universally, dealers I spoke with recommended this solution and I gladly moved on from the Century debacle.

After the S-TEC 60-2 was in-

stalled, we began the final step in avionics upgrades, adding an Aspen Avionics EFD1000 Pro PFD and EFD1000 MFD, converting the remaining engine instruments to digital and replacing the EFB with a Garmin GPSmap 695.

Finally, I have an autopilot system in my 310 that performs nearly as well, if not better in most situations than any autoflight system I've used. As with any system, there are compromises and human interface engineering design features, particularly on the older-design S-TEC 60-2, that leave room for improvement.

However, the integration of the Aspen system with a capable autopilot such as those offered by S-TEC provides a pilot with true state-of-the-art functionality. I am as comfortable flying behind the Aspen/GNS 480/S-TEC system as I am flying behind the Honeywell Pegasus EFIS/FMGS system on the Airbus.

The intuitive nature of the Aspen system makes for a shallow learning curve. Unlike my experience with Century, the reliability of both the Aspen system and the S-TEC autopilot has proved superb in the nine months since it has been installed. Customer service with Aspen has been nothing short of exceptional—something unique in the GA market during these troubled economic times.

The recent addition of the Aspen MFD for displaying XMWX weather, traffic and, most important, a truly redundant full backup to the PFD, has been a welcome addition. The Aspen GPSS integrates well with the S-TEC 60-2, providing a fully automated flight control system very similar to what I've enjoyed for years at the airline.

## END GAME

Unquestionably, I've invested more on upgrading my 310 than the airplane is worth. But because airframe values have declined so markedly, avionics now represent the lion's share of aircraft value. However, I am finally satisfied with what I have



this with the Cessna/Sperry 400-series systems found in larger Cessna singles and twins. The gyros for these are pricey and parts to rebuild them are scarce. Similarly, the later flavors of the King KI256 flight director that feeds the KFC200 and newer KFC150-series autopilots are workable. They run several thousand to overhaul.

The dilemma surrounding the A/P gyro is evolving as Garmin works to expand the GAD43 electronic

and have no plan to sell the airplane... ever.

The journey was filled with minefields in an autopilot industry that has too few competitors to be an efficient market. Owners should consider taking meticulous care of whatever autopilot they already have.

If you're buying a used airplane in which an autopilot is must-have equipment, make the autopilot a first priority, focusing on brands that provide reliability and customer

## AVOIDING JUNK AUTOPILOTS

There are so many autopilot models in service—too many to list—that you'll need the help of an autopilot pro to determine what's still serviceable in a used airplane. As a rule, the complexity of the aircraft is proportional to the complexity of the autopilot. Pre-purchase inspections should include analysis of the autopilot, including research of prior maintenance and a thorough flight test.

To our surprise, several autopilot shops told us that many older systems—and we're talking about mod-

els that are over 30 years old—are still readily serviceable. Not surprisingly, the common thread is that old gyros that feed these systems are the biggest source of headaches. Be cautious of

autopilot emulator interface for its G500/600 PFD. This digital converter box uses an AHARS reference for driving an otherwise ancient analog autopilot, eliminating the spinning gyro altogether. Such an interface already exists for the King KFC-series and the ones we have flown outperform the KI256. Aspen is working on an interface for its PFD, too. But the gyro is only part of the system. The drive transistors found in many Bendix FCS-series autopilot computers are becoming scarce. The same is true of servo motors that just aren't field-repairable.

Lower-end systems you'll find in a Cherokee—the Century II and Piper Autocontrol III—aren't exactly throw-away, but don't expect spectacular performance. These are known to create tail-chasing intermittencies due to split-pin connector sockets in the harnesses. Reworking these harnesses is what ruinous autopilot repair bills are made of. How about later-model Cessnas with the KAP140? Examine log entries to ensure that bulletins on the servos have been addressed.

Given the slim pickings on the current autopilot market, even pricey upgrades might not yield the best performance for heavier airframes. While S-TEC's line of rate-based systems are proven reliable and cost effective to install and maintain, they might not yield the performance of a vintage attitude-based system still on its game.

support. Finally, if you find yourself having to upgrade your autopilot or autoflight system, find a shop that will work with you and support you until you are satisfied as you navigate what I found to be nothing less than a make-or-break adventure.

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*Ken Sutton is chief market economist for a private investment partnership and a former airline captain with 12,200 hours of flight time.*



AIRCRAFT FLIGHT TRIAL

## Legend Amphib: Fun-to-Fly Eyecatcher

*A Legend Cub married to floats brings back basic, affordable water flying. A simple panel and an airframe diet makes the payload reasonable.*

by Paul Bertorelli

If you park a Cub on a ramp, you'll soon draw a crowd. If the Cub is on floats, you'll need crowd control and that, in a nutshell, describes what may be American Legend's best marketing ploy.

At the U.S. Sport Aviation Expo in Sebring, Florida, last winter, Legend introduced the amphibious float version of its popular LSA Legend Cub. By dint of sheer size, it drew a constant stream of attention—the airplane towers over the typical diminutive LSA and it's one of only a small number of LSAs being sold as purpose-built amphibians. (We covered two others, the Searey and the Seamax in the August 2009 issue, both flying boats.)

While we initially thought the Legend amphib was a conversion kit available for any existing Legend,

it turns out not to be. That's not to say a Legend couldn't be fitted with floats, but the airplane we flew is a purpose-made amphib and owner Dick Parsons told us he doesn't have land gear for the airplane. (That's an option.)

The challenge for LSAs on floats is weight. The LSA max gross for float-equipped airplanes is stretched from 1320 pounds for land planes to 1430 pounds for aircraft intended for water operation. That's only a 110-pound delta, so obviously the float system has to be light. And so does the airplane itself.

When floats are fitted, there's an exchange weight between removing the land wheels and installing the floats, but the 1430-pound limit doesn't leave much headroom. The reality is that LSA floatplanes are

likely to be flown a bit overweight, which is common practice for most light floatplanes.

For Parsons' amphib, the empty weight is around 840 pounds with land gear. Remove that and add the 235-pound float rig and the total empty weight is just under the 1000-pound empty weight limit, at 998 pounds. That leaves 432 pounds of useful load and capacity for two not-too-heavy people and enough gas for a short flight. Or one person and enough fishing and camping gear for a couple of weeks.

### BAUMANN FLOATS

There only a handful of compa-

### AC TV



For a video on *Aviation Consumer's* flight trial of the Legend amphib, log on to our sister publication [www.avweb.com](http://www.avweb.com) and click the video button in the upper right of the home page. Scroll down to the Legend amphib video.

nies making floats for LSAs and a couple of these companies told us they haven't installed any yet. For its amphib project, Legend worked with Baumann Floats of New Richmond, Wisconsin, to develop the BF 1500 install for the Legend. These floats are also approved for the J-3 Cub, PA-11 and Taylorcraft, plus the FK-9 LSA.

Apart from being exceptionally light, the 1500 floats are typical of amphib hardware. They're nicely made of 6061-T6 aluminum riveted together with caulked seams for water-tightness. Each float has eight watertight compartments, each fitted with a removable cap so they can be pumped dry of any water. The float bottoms are fluted which, according to Baumann, ride smoother in the water and reduce weight by eliminating the need for cross bracing.

The main wheels hide inside the center of the floats while the front wheels are mounted on the stems. The gear itself is controlled by a Johnson bar lever to the pilot's left, and there are wire flag gear indicators on the top of each float confirming gear position. You can also see the nose gear position over the top of the float. The floats have retractable water rudders, which are handy for beaching.

Many float plane owners revert to land gear when the lakes freeze and to do that in the Legend, it can be lifted from the top by attaching to the wing center section, a beefy latticework of welded steel tube that's typical of the airplane's entire construction. Parsons told us the conversion takes a couple of hours, and involves removing a half dozen bolts and re-rigging the gear and water rudder cabling.

## MINIMUM PANEL

The well-established trend in LSAs is premium panels with EFIS systems rivaling the capability of certified gear like the Garmin G1000. But because of weight restrictions, the amphib Legend doesn't qualify. Legend's Darin Hart told us that keeping the airframe on the diet was necessary to make the empty weight limit, so Dynon Skyview or other new age electronics aren't options. But then why do you need that stuff to fly VFR into a backcountry lake?

Parsons' Legend is typically equipped with a Garmin GPSmap



*The amphib's panel is necessarily spare to save weight. The gear is operated by a Johnson bar, right, and water rudders are fully retractable, as shown in lower photo.*

496 (the 696 is an option), an SL40 comm and a GTX327 transponder. The panel is otherwise quite spare, with not even an attitude indicator, but an airspeed indicator, altimeter and tachometer.

Although the land version is available with the 100-HP Continental O-200 in either open or closed cowling configuration or the Jabiru 3300A at 120 HP, the amphib gets only the O-200D, again for weight considerations. It has a three-pitch, ground-adjustable prop.

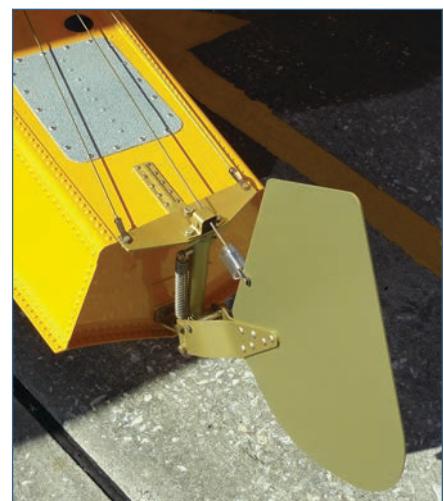
## FLYING IT

For a light sport with only 100 HP and at its weight limits, the Legend amphib turns in performance that's better than an old Cub on floats and maybe rivaling more powerful aircraft like the Cessna 185. Obviously, it doesn't carry nearly the payload.

For our test hop with Dick Parsons, we found a small freshwater pond of a couple of acres and we shot video with takeoff runs in the 10- to 12-second range. Baumann's Joe Birkmeyer apparently managed a 7-second run during testing, which strikes us as quite a feat.

Surprisingly, the amphib is no slouch in cruise, even dragging those big floats. On the way to the pond, we saw 95 MPH at 700 feet, which is fast enough to actually go places that aren't in practical reach of a 65-MPH Cub.

Since the Legend is essentially a Super Cub airframe (without the



flaps), its cabin is a bit more commodious than a J-3 and, indeed, some of the other LSAs. Ingress and egress with the floats is actually reasonable because there's more stuff to perch on and grab hold of.

At \$159,000 complete, the amphib is near the top tier for LSA pricing, but we think it's a fair value given the airplane's exceptional build quality and attention to detail. For more information, contact Legend at [www.legend.aero](http://www.legend.aero) or 903-885-7000.

# Piper Archer

*It springs from a long line of successful 180-HP airframes for a reason. It's comfortable, anyone can fly it and it carries a lot for not much money.*



In the heady days of the 1960s and '70s, personal airplane manufacturers were heavily invested in marketing their products the same way Detroit had been selling cars: Get new owners hooked on an entry-level model, offer several step-up models and make annual but incremental improvements. Just as Detroit's Big Three had dealer networks, Beech, Cessna and Piper had them also, offering everything from primary flight training to maintenance, rental and charter.

Rarely would a new pilot trained in, say, a Cessna 150 look at another manufacturer's product as a step-up airplane, because a larger, faster version of what he was already flying was readily available. Brand loyalty was important to general aviation's Big Three back then, just as it was to Detroit. But times changed, models were eliminated and some brands went out of production entirely, at least for a time.

Despite economic upheavals, the microcomputer revolution and the advent of "plastic" airplanes, the realities of aerodynamics, along with design, certification and manufacturing costs mean some models first conceived in the 1950s are still popular today. But

that's true only because those older designs perform well enough that potential new entrants know they'd encounter stiff headwinds trying to bring a new model to market.

For proof, look no farther than the market for new, four-seat, fixed-gear piston singles of less than 200 HP, which has long been dominated by Cessna and its 172. Along the way, Piper carved a deep niche with its

ered by a Lycoming O-360, which has proven to be a durable powerplant well suited to the airplane's weight and performance. Before becoming the Archer in the mid-1970s—and before gaining a tapered wing and becoming the Archer II—it already was among the most popular Cherokees.

For many, the Cherokee 180/Archer is about as close as mere mortals can get to the perfect airplane. It has

simple systems, a stone-reliable engine, sufficient room that four adults won't commit immortal acts and economics good enough to serve as a basic trainer. For cross-country work, it has enough speed to make most headwinds only a slight nuisance and long-enough legs to be a decent though entry-level instrument platform. All of which means a good Archer will command a healthy price on the used market and, depending on year, generally will cost a bit more than an equivalent Cessna 172.

Of course, the 172 isn't the Archer's only competitor: Cessna's own fixed-gear Cardinal, the Grumman/AGAC Tiger and the Beech Sundowner abound on the used market, often available for many fewer dollars. But the Archer's mix of good numbers, good looks and ongoing production—

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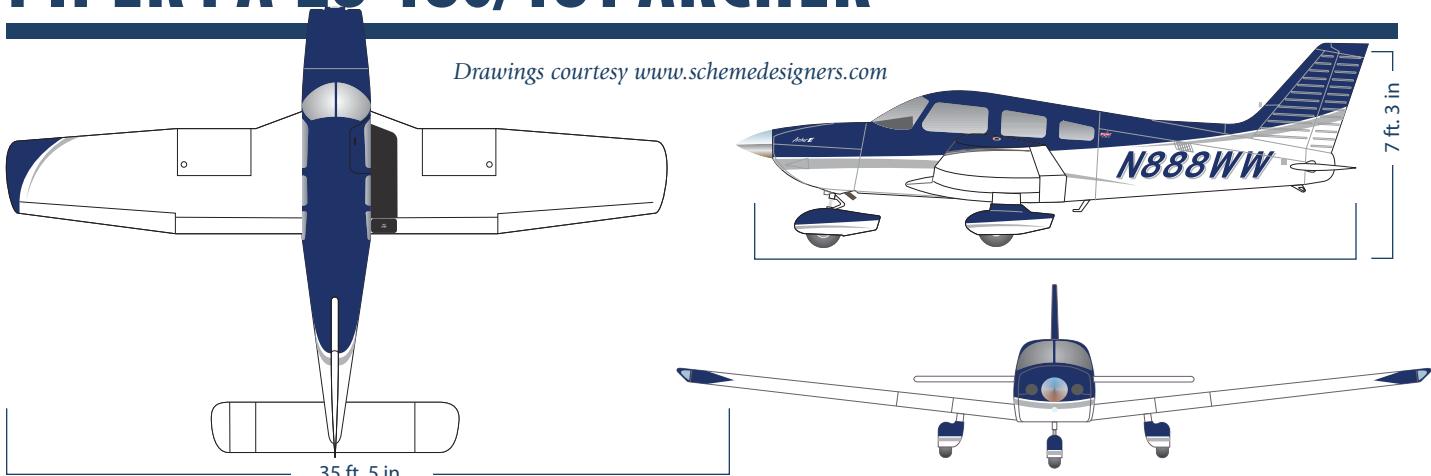
*The Archer is in many ways a product of the brand loyalty that continues to drive the GA market.*

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Warrior and Archer. No viable competition has emerged, despite both designs having originated during Eisenhower's years in the White House. And until the mid-1990s, the 172 wasn't available fresh from the factory with a fixed-pitch propeller and more than 160 HP, while Piper offered the Cherokee 180, a model besting the basic Skyhawk in almost every category and which remains available today as the Archer III.

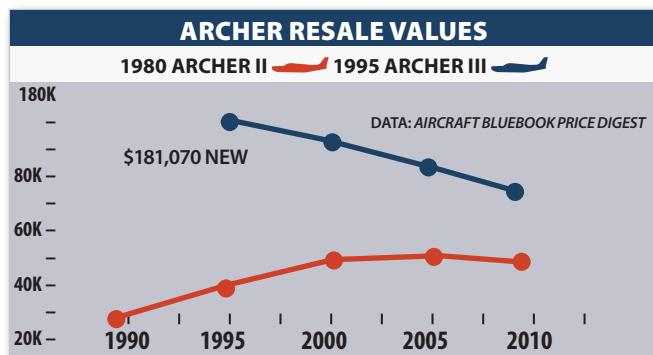
The original PA-28-180 was pow-

# PIPER PA-28-180/181 ARCHER



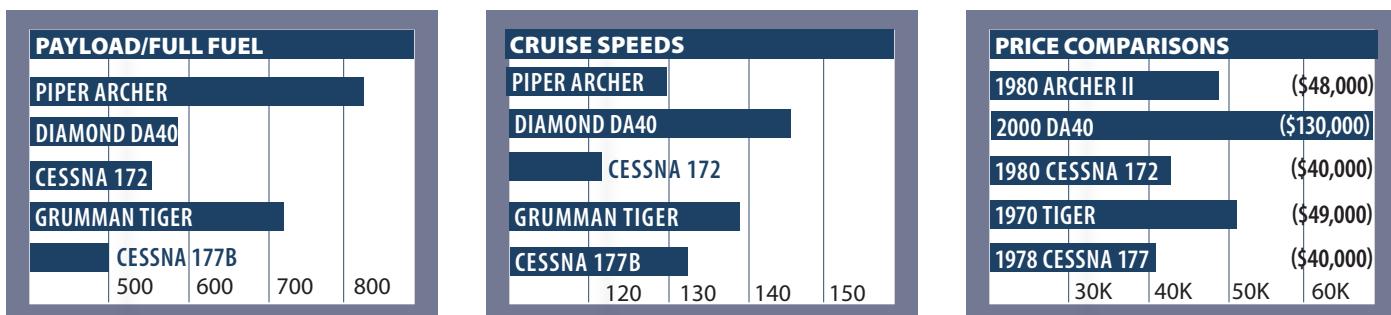
## PIPER CHEROKEE 180/ARCHER SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1963-64 PA-28-180B	LYC. 180-HP O360-A3A	2000	\$19,000	50	1170 LBS	124 KTS	±\$29,000
1965-67 PA-28-180C	LYC. 180-HP O360-A3A	2000	\$19,000	50	1170 LBS	124 KTS	±\$31,000
1968-69 PA-28-180D	LYC. 180-HP O360-A3A	2000	\$19,000	50	1090 LBS	124 KTS	±\$36,000
1970 PA-28-180E	LYC. 180-HP O360-A3A	2000	\$19,000	50	1090 LBS	124 KTS	\$39,000
1971 PA-28-180F	LYC. 180-HP O360-A3A	2000	\$19,000	50	1090 LBS	124 KTS	\$41,000
1972 PA-28-180G	LYC. 180-HP O360-A3A	2000	\$19,000	50	1090 LBS	124 KTS	\$43,000
1973 PA-28-180 CHALLENGER	LYC. 180-HP O360-A4A	2000	\$19,000	50	1055 LBS	123 KTS	\$45,000
1974-75 PA-28-180 ARCHER	LYC. 180-HP O360-A4A	2000	\$19,000	50	1055 LBS	123 KTS	±\$48,000
1976-1994 PA-28-181 ARCHER II	LYC. 180-HP O360-A4M	2000	\$19,000	48	1134 LBS	125 KTS	RANGE: \$33,000 – \$79,000
1995-2000 PA-28-181 ARCHER III	LYC. 180-HP O360-A4M	2000	\$19,000	48	1134 LBS	125 KTS	\$85,000 – \$140,000
2001-2005 PA-28-181 ARCHER III	LYC. 180-HP O360-A4M	2000	\$19,000	48	870 LBS	125 KTS	\$115,000 – \$150,000
2006-2010 PA-28-181 ARCHER III	LYC. 180-HP O360-A4M	2000	\$19,000	48	870 LBS	125 KTS	\$150,000 – \$299,500



SELECT RECENT ADs	
AD 04-14-12	CONTROL WHEEL HARDWARE
AD 99-05-09	INDUCTION AIR FILTER
AD 96-10-03	FLAP HANDLE ATTACH BOLT
AD 95-26-13	OIL COOLER HOSES
AD-86-17-01	AMMETER REPLACEMENT

## SELECT MODEL COMPARISONS





**In new Archers—1999 models and newer—Piper adopted a stylish all-metal panel design and Garmin GNS430s became standard. Older panels, such as the Archer II, lower photo, are utilitarian and have room for modern avionics. One beef is the low-mounted power gauges.**

which usually translates into excellent parts availability—means its popularity likely will continue. Prospective owners know that and usually are prepared to pay the premium required.

## MODEL HISTORY

The PA-28-180/1 series, of course, can trace its roots back to the basic Cherokee 140 and point to close relatives like the Arrow, Cherokee Six/Lance/Saratoga and even the Seminole twin. All owe their existence to the first Cherokee airframe originally designed by the late John Thorp, best known for the crank-winged Thorp T-18 home-built, among his many other designs. He reportedly considered the PA-28 among his favorites and, if viewing an original copy in plan form, one can easily see the resemblance between the first Cherokee and the Thorp T-18.

And this Piper's lineage highlights

something Piper has always done well, perhaps better than everyone else: Build a good basic model and evolve it into improved follow-on products without greatly increasing manufacturing costs. First rolled out in 1963, the original Cherokee 180 has been upgraded considerably but is fundamentally still the same airframe, with some 10,000 flying.

The first Cherokee 180 had the constant-chord Hershey-bar wing (span 30 feet)—so-named because of its resemblance to the confection—and a Lycoming O-360-A3A engine. That early engine had a TBO of only 1200 hours, mainly due to a weak valve-train design, including 7/16-inch exhaust valves, which was far from Lycoming's best effort. Later, those engines were switched to 1/2-inch valves, which increased the TBO in part by eliminating chronic issues with excessive wear and heat-induced damage. The smaller valves long ago should have been flushed entirely from the market by overhaul or remanufacture, but prudent buyers will check anyway if looking at an older engine.

The newer engines all carry Lycoming's more-or-less standard 2000-hour TBO, and the overall engine has a well-earned reputation as one of the company's—if not the industry's—more bulletproof designs. In fact, the engine's reputation is one of the reasons for the Archer's ongoing popularity. Throughout its history, the PA-28-180/1 has used essentially the same Lycoming O-360—still 180 HP—with only minor variant changes.

After five years of production and few airframe changes, the instrument panel was modernized and a third, trapezoidal window was added to each fuselage side in 1968. This resulted in the airplane's current ramp presence while admitting more light into the cabin. A longer wing came along in 1973—still with a constant chord, though—accompanied by a bigger stabilator and a five-inch fuselage stretch. The extra inches made a noticeable difference on cabin space.

At the same time, a modest, 50-pound boost in gross weight (to

2450 pounds) improved the airplane's payload by half a person while a larger door, more-crashworthy seats and additional panel improvements rounded out the cosmetic improvements.

For 1973, the Cherokee 180 became the Challenger, but that wasn't a Native American name, so Piper quickly changed it again—to Archer, beginning with the 1974 model year—continuing its ongoing theme. (Neither of those strictly are Native American names either but despite the illogic, Piper's are easier to follow than Mooney's.)

It wasn't until 1976 that the new tapered wing—still the standard configuration today—was introduced to the 180-HP airframe, resulting in the type-designation change to PA-28-181, which also continues with the current model. This change was so significant the model received yet another name: Archer II. Current-manufacture PA-28-181s are known as Archer IIIs.

The basic tapered wing first was installed on the then-new 1974-era Warrior and, after a few tweaks involving the aileron control system, was added to the company's other PA-28 models and, eventually, to the PA-32. The new wing's inner panels were still constant-chord, while the outer panels were both lengthened and tapered. Wing-mounted fuel tanks remained in the same location, although total unusable fuel increased to two gallons.

The Archer II got a powerplant change as well, to the -A4M version of the 180-HP Lycoming O-360. That same engine is installed in new Archers today. These changes, of course, brought escalating prices. An original, 1974 PA-28-180 Archer with average equipment brought in \$23,495 to Piper's coffers while a typically equipped 1980 Archer II sold for \$47,610. There was no 1991 Archer, as Piper became ensnared in the light-aircraft industry's overall economic troubles but by 1995, a reinvigorated and re-branded company—New Piper—rolled out the Archer III. It sold for \$181,700, again with average equipment installed.

By then, the New Piper Archer III had gone through numerous changes, including an upgraded cowl, an all-metal instrument panel, factory-installed Garmin GNS430/530 navigators, new paint schemes, air conditioning, better seats and an improved exhaust system. A 2010 model retails for \$299,500, and comes standard

with an Avidyne Entegra glass panel, an S-TEC 55X autopilot, air conditioning, two Garmin 430W s.

## MARKET SCAN

Any would-be owner wanting to upgrade from a basic trainer—or even looking for an affordable entry-level airplane to use as a trainer, then as a platform with which to perform the weekend getaway—always should at least consider an Archer. It's a bit faster than a Cessna 172, it climbs better and it carries a smidge more, all without gulping fuel the way a 182 does. Maintenance costs are on the low side of reasonable. On the flip side—at least when compared to the Skyhawk—there's only one door and passengers may not like clambering up on the wing to gain entry.

Despite the tapered wing's better looks and—as many pilots confirm—its improved roll response, the market hasn't always treated the Archer II well. In fact, there's not much difference in performance between the Hershey-bar-winged versions and the tapered wing. The original Archer wing's span of 32 feet increases to 35 feet, five inches on the Archer II after it's tapered, while service ceiling decreases and takeoff ground roll increases. Distance to clear a 50-foot obstacle is markedly reduced by tapering the wing, however, as is stall speed.

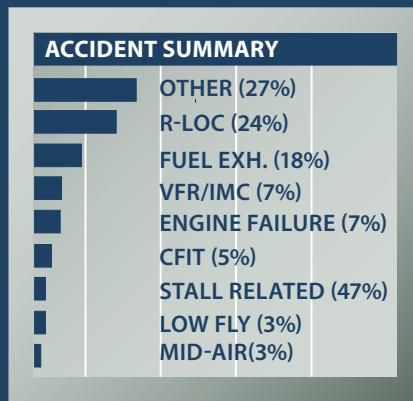
Those numbers—and perhaps the ability to use a smaller hangar—probably explains why early Archers—the 1974 and 1975 models—today sell in the \$45,000 range, according to a recent *Aircraft Bluebook Digest*, while their slightly younger brethren fetch less, on average. The deficit isn't overcome until the 1980 model but—all things being equal—prices start escalating from there. By comparison, a 1980 Cessna 172 retails for about \$40,000 while a Grumman/American General Tiger of about the same vintage sells for around \$50,000. Archer IIIs start out at around \$80,000.

Given the wide range of model years and histories of used Archers, it should be expected they will vary widely in installed equipment. Unlike Cessna—which only installed its house-brand ARC avionics in new piston singles until selling the unit in 1983—Piper put into its Cherokees either King or Narco products for quite some time. A recent scan of *Trade-A-Plane* revealed quite a few earlier

## ARCHER ACCIDENTS: R-LOC, FUEL

In reviewing the PA-28's recent accident pattern, we were struck by one thing: Piper has made a reliable, easy-to-fly airplane, but pilots do a poor job of letting it keep them out of trouble.

As in our review of the model five years ago, the miscellaneous category led the league, a veritable



Archers with motley panels in which an old Bendix/King KX-170B was replaced with a newer digital KX-155 or, occasionally, a Garmin GNS430. Some have mid-1980s upgrades with Bendix/King Silver Crown stacks. Many still have ADFs. Clearly, some Archers have gone through extensive upgrade cycles but if owners lavish big bucks on these airframes, they probably tend to keep them and not flip them into the used market.

## LOADING, PERFORMANCE

For 180-HP airplanes, Archers haul respectable loads. Empty weights vary by year and example, of course, but one owner told us his PA-28-180's empty weight was 1452 pounds on a gross weight of 2400 pounds. With full tanks, that allows 650 pounds of people and stuff, or three husky people and a bit of baggage. Not bad.

Later Archers allow a 2550-pound gross but empty weights are often higher, so payloads are lower. A 2010 Archer III with standard equipment, says Piper, weighs in at a hefty 1688 pounds empty and comes with a ramp weight of 2558 pounds, for a useful load of 870 pounds. Older Archers might beat that by 75 pounds or more. With four people in the airplane and, say, 50 pounds of baggage, a typical example has room for 35 to 40 gallons

cornucopia of creative pilot bumbling. But not universally, actually.

The "other" category revealed a couple of weird mechanicals such as a broken aileron control circuit and a fire due to a loose fuel fitting. And speaking of fuel, Piper has an idiot-proof fuel system, yet pilots still manage to fill it with air at an alarming rate. Nearly one in five PA-28-181 accidents are due to fuel exhaustion. Although the aircraft tankers only 48 gallons, that's a reasonable load for this class of airplane. Pilots simply try to stretch it too far. Runway loss of control (R-LOC) is the real biggie, however, accounting for nearly a quarter of all Archer accidents. These include losing it in crosswinds, undershoots and over-runs and just running into innocent bystanders.

of gas, or about three hours' endurance with 45-minute reserves. Again, not bad for a modest airplane. If the passengers are light, full fuel and full seats may be possible.

Performance-wise, the Archer is respectable, but no one will mistake its numbers for a Bonanza's, or even an Arrow's. How fast you go on 180 HP depends on the year of manufacture and the equipment. Specifically, the semi-tapered wing on the 1976 and later Archers yielded benefits at both ends of the airspeed spectrum. The stall dropped by four knots and cruise speed went up by about the same amount. The large wheel pants available in 1978 add another four knots or so to cruise speed.

Even so, a late-model Archer with wheel pants will cruise at only about 120 knots, although some owners insist they see 125 to 130 knots. (We suspect erroneous airspeed indicators or tachometers.) The airplane gives up 10 knots to a Tiger but pulls ahead of a Cessna 172. Climb rate, while better than a 172, isn't stellar. According to the POH, the airplane will climb out from sea level at about 740 FPM but, by the time it reaches 6000 feet MSL, upward mobility has trended off to around 450 FPM. As noted earlier, original Archers with the Hershey-bar wings eke out slightly better rate-of-



**The O-360 Lycoming is one of GA's better performers. It's reliable and easy to maintain. In the Archer, the accessory case is readily accessible. One reason the Archer has excellent payload is that it doesn't carry much fuel—48 gallons. A tank in each wing is managed with a single left/right/off valve.**

climb numbers than later models with tapered wings. The nosewheels are steerable on the ground, and the rudder pedals come with conventional toe brakes. Parking or emergency braking is controlled by a meaty handle and locking mechanism just to the left of the center console and easily manipulated with the pilot's right hand.

Unless the airplane is air-conditioned, summertime cooling of the occupants can be a problem on the ground and at low altitude. Fresh-air ventilation is via wing-root inlets with outlets above the floorboards, supplemented by fan-driven overhead vents getting fresh air from an inlet at the top of the vertical stabilizer. Neither works well on the ground, requiring an open-door policy until right before takeoff. The good news is the Archer's heating system usually works well.

Piper long ago abandoned its overhead pitch trim control—pilots never could remember which way to turn it to get what they wanted—and put a conventional wheel on the center console, between the seats. Below the instrument panel, in a center pedestal, is a reliable rudder trim knob, though it's not always necessary.

Early airplanes came with a double stack of avionics, with less-critical boxes mounted in a second column to the right of center. Again, many of these airplanes have since seen an avionics shop for upgrades, but many others haven't. Reaching to the far side of the panel isn't a chore, but it's surely an inconvenience and something you should consider when inspecting a potential purchase. Recent upgrades may have eliminated boxes from the right stack, but unless the entire panel was redone, cosmetics may suffer.

Wing flaps are controlled with a Johnson-bar handle between the seats, including detents. It's an easy system to deploy smoothly, while also affording the ability to immediately retract or extend flaps, depending on your needs, without having to wait for an electric motor. And, of course, they're fully available even in the event of an electrical failure. Deploying flaps does result in an upward pitching moment, but it's relatively easy to counteract with forward pressure on the yoke. Most crosswinds are easy to handle, thanks to the low wing and relatively wide main gear.

Early airplanes mounted the circuit breakers to the far right of the instrument panel, about as far from the pilot as possible. Same with the heat/defrost controls. On the up side, frequently needed switches—master, fuel pump, beacons and the like—are mounted just above the engine controls. Systems gauges are just below the flight instruments, with an idiot-light annunciator panel above them. The tachometer is mounted in front of the pilot's right knee, which often makes for unnecessary head motion during takeoff.

## COMFORT, HANDLING

Occupants should have no trouble remaining comfortable during a three-hour leg, although pre-1973 back

seats—before the five-inch fuselage stretch—are somewhat tight. Pipers have decent but not exceptional front seats with an S-shaped frame designed to absorb energy in a crash. The height adjustment uses a gas-assisted spring and when this wears out, the seat automatically falls to its lowest setting, giving a short pilot a good view of the glareshield, but little else.

The seat stuffing tends to compress with use, causing sags, and the plastic back trays on the seats aren't at all durable and fall apart with use. The aftermarket is your friend, as relatively inexpensive solutions exist for both well-known issues. There's an adequate baggage compartment behind the rear seats that's accessible in flight. Although the baggage door can be opened from the inside, the back windows can't.

Cabin appointments can range from the original avocado green or bright orange upholstery and sub-panels dating from the 1970s to more tasteful and less-jarring designs, including what seems to be the new industry standard: light gray fabric or leather. Later models came with all-metal instrument panels—the Royalite plastic overlays were finally banned.

The Piper Cherokee didn't get to be an industry-standard airplane by having handling quirks; it simply has none. Its flight controls are relatively well balanced, with roughly equivalent pressures required in all three axes. The Archers are safe, stable and predictable and easy to land, even on short runways. In slow flight, the airplane has no bad habits, nor does it build speed in unusual attitudes.

## MAINTENANCE

Archers don't have much AD baggage. It was the target of a controversial AD in 1987 calling for an expensive inspection of the wing spar for cracks. This procedure required de-mating the wings and cost some \$1200 at the time. In typical FAA overreaction, it was an emergency measure brought about by the crash of a 7000-hour Archer used for pipeline patrol. That AD was rescinded when the expected rash of cracked spars failed to materialize.

However, in reviewing recent service difficulty reports, we noted that mechanics are finding evidence of corrosion in the spars, at least one of which required replacement. This

*Piper's crushed velour seats of the 1980s are a thing of the past. Newer interiors are tastefully done in leather, with composite side panels.*

corrosion is often discovered when leaking fuel tanks are removed for repair. Make sure a pre-buy includes an inspection and check the wing-attach fittings, too. Check the baggage door for a leaking seal; the tell-tale sign is wet or waterstained carpet on the baggage floor. By now, early Archers should have been through at least one interior refurbishment, so pulling up the floorboards in that area to inspect for corrosion is a good idea.

While you're back there, take a few extra moments to inspect the battery box just aft of the baggage compartment. Piper placed it there, presumably to help with loading. But in a misguided effort to save weight, the company at one time equipped its airplanes with aluminum battery cables, which proved susceptible to corrosion. Given the lengthy cable run from the battery box to the engine compartment, many owners have encountered starting issues. Aftermarket kits and a Piper service bulletin are available to help replace the aluminum cables with copper, which isn't as prone to corrosion and high resistance.

Another problem is leaky fuel tanks, particularly on older airplanes. An airworthiness directive (AD 79-22-02) addresses peeling tank sealant, with which owners long ago should have complied. It's not much of a problem any more, certainly nothing like the hassle of owning a Mooney. The vents are also a source of maintenance trouble. One SDR found they had been installed incorrectly.

Otherwise, maintenance hotspots have to do with typical Lycoming issues, such as cracked cylinders, corroded cams and problems with Bendix and Slick magnetos. Also, on older airframes, the stabilator bushings may need work. Have them checked during pre-buy. Another area to look at, according to the SDR database, is cracking in the skins of the forward wing walk. One SDR submitter reported six high-time airframes with this damage.



### MODS, TYPE CLUBS

Various aerodynamic mods are available from LoPresti Speed Merchants ([www.speedmods.com](http://www.speedmods.com), 877-565-1731) and Met-Co-Aire ([www.metcoaire.com](http://www.metcoaire.com), 800-814-2697). LoPresti has flap gap seals, wheel pants and flap hinge fairings. Met-Co-Aire offers replacement wingtips, tailcones and dorsal fins. LoPresti also offers its BoomBeam landing-light enhancement.

Knots 2 U ([www.knots2u.com](http://www.knots2u.com), 262-763-5100) also sells a range of Cherokee mods, including gap seals, wingtips and wheelpants. The company also offers upgraded strobe lights, engine air filters, speed brakes (!) and aftermarket control wheels, among other products.

Laminar Flow Systems ([www.laminarflowsystems.com](http://www.laminarflowsystems.com), 888-327-8140) offers a wide range of gap seals, wheel fairings and other aerodynamic clean-up kits for the Cherokee. For fiberglass parts to replace broken or cracked plastic exterior fairings, of which the Cherokee has many, try Globe Fiberglass ([www.globefiberglass.com](http://www.globefiberglass.com), 800-899-2707).

There are two type clubs serving the Piper Archer models. The Piper Owner Society (POS, [www.piperowner.org](http://www.piperowner.org)) consolidated its efforts with the Cherokee Pilots Association (CPA) a few years back. The Piper Owners Society serves all Piper products; the CPA's popular Cherokee Chat Line, an online community at [members4.boardhost.com/piperowner](http://members4.boardhost.com/piperowner), continues (members only). Meanwhile, the Piper Flyer Association (PFA, [www.piperflyer.org](http://www.piperflyer.org)) offers services similar to POS's.

### OWNER COMMENTS

We have operated Warriors and Archers since 1977. Our Archer II

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has about 14,000 hours while our Archer III is approaching 7000 hours and is our most popular private-hire aircraft. The Archer III is quieter and smoother, but it is 180 pounds heavier than the Archer II and is definitely only a three-person aircraft for all but the shortest flights. It's disappointing the 100-pound gross weight increase made available to the Warriors did not apply to the Archer. Now the Warrior has a better range/payload envelope than the Archer.

Maintenance is less than the Archer II probably because the III is 20 years younger. However, the price of some components is eye-watering (e.g., the 24-volt battery, the 24-volt boost pump, the back-up vacuum-pump/manifold/regulator, which are life-limited components). The O-360-A4M has not been as good as the O-320 in the Warriors, but the one installed in the III is now 1000 hours into its fourth overhaul and is still on its original crankcase and crankshaft.

Like all the Warrior/Archer/Arrow aircraft, cabin noise can be kept to moderate levels because of well-fitting doors and seals, and on our uneven grass taxiways there is no creaking and rattling of the airframe, and the doors never come open in flight, unlike Brands C and B.

We do find that the Archer propellers incur more stone damage because they are longer than the Warrior ones, and the nose strut is usually more compressed because of the greater load on it. The main gear legs behave much the same as do those on the Warriors. All of them suffer because of the uneven grass. We have to replace the leg at about 10,000 hours. Wing walks usually run 4-to-5000 hours.

The Archer III has a decent alternator, whereas the one fitted to the Archer II and the Warriors is a disgrace. They are supposed to run the life of the engine (2000 hours), but we average about 250 hours and have had brand new ones fail in as little as 20 minutes. Same thing for starter motors. In both cases, the maintenance strategy is to replace it when it breaks, which makes a mockery of the concepts of safety in an aviation environment.

On balance, I think that the Archer III probably costs a little less to run than Brand C, but out here in Oz, we miss the free sunshade. The Warriors and Archers are easier to land; howev-

er, there is one serious fault with the control column. It tends to be gripped by the sleeve where the column comes out of the panel. The binding occurs at about the position of the column during the flare and is erratic.

If it grips then the aircraft lands heavily because the pilot will not have pulled back hard enough. Next time he pulls a little harder and the column doesn't grip, and the aircraft balloons. Lubrication helps but it dries out and makes black marks on hands and clothing. This does not happen with brands B and C.

Name withheld by request

I have owned a 1979 Archer II since 1998. I just sent it in for engine over-haul, after putting about 500 hours on it. It has been a pleasure to own. A few small problems have been persistent—bleeding the brakes, shimmy in the nosewheel—but all in all quite reliable. The engine made about 100 hours beyond TBO but was using some oil. It is insured for \$50,000, but with the new engine I will increase that. Insurance has been about \$900, but this year was reduced to \$600!

I've had a commercial ticket with instrument rating for over eight years and no damage claims. It will haul four adult men and full fuel on a winter day without difficulty, which I learned before I owned and flew the airplane. Mostly fuel burn is 9-10 gal/hr. As the engine became older, I slowed down to around 70-percent power and saw about eight GPH when routinely flying at 120-125 knots.

I thought for a while about moving up to a retractable, or even down to an LSA, but decided instead to overhaul my friend and keep flying it. For the money, performance, and the cost of maintenance and operation, this is probably the best I can do.

Martin Dixon  
Via e-mail

I own a 1980 Piper Archer II, which has been a great aircraft for me in both business and pleasure for the past 12 years. Cost of operation has been within reason.

Annuals average less than \$1000 without much more than normal maintenance items. Insurance has been about the same, but I now fly less than 50 hours/year. I flight plan for

10 GPH, but I can get it down to eight at altitude and leaned back to cruise, indicating 120 knots.

The engine has slightly more than 1600 hours on it, but compressions still run in the upper 60-to-mid-70 range. I'm starting to notice oil leaks where the crankcase halves meet.

The aircraft has been hangared for the most part, and tied down when on a business trips. The original paint is showing wear mainly due to the canopy cover rubbing.

## RETRACTS

(continued from page 16)

~~W~~hile ~~it~~ ~~haven't~~ ~~come~~ ~~down~~ ~~to~~ ~~our~~ ~~arbitrary~~ ~~\$60,000~~ ~~ceiling~~—yet—so we considered two more aged models: the classic "short-body" M20C and the slightly stretched M20F. Before the company changed its model names, these were known as the Ranger and the Executive 21, respectively.

Other than horsepower and fuselage length, there's very little difference between them. Both are well-built airplanes, featuring a welded steel-tube cabin enclosure, laminar-flow wings, incredibly strong landing gear and pushrods instead of the control cables other manufacturers use. The basic M20C was first marketed in the early 1960s and, while much of the cosmetics changed over the years, little else did. And why mess with success? Johnson bar-operated gear and rubber doughnuts to cushion the landing help make a relatively simple, economical single.

For those who might automatically discard the Mooney from consideration due to its diminutive cabin size—which mostly is an optical illusion, anyway—there's the longer M20F. Twenty more horsepower helps haul around the extra sheet metal, though everything else remains pretty much the same as on the M20C. Either model is a good choice for an economical cruiser. While the manufacturing company has been through more changes of ownership than we can count—raising the specter of parts scarcity in the future—enough demand and aftermarket suppliers exist to minimize those concerns.

**PIPER**

Despite the Mooneys' renowned efficiency, another company has done well with laminar flow wings: Piper's Comanche had them, along with a wider cabin and more engine choices. In fact, the 180-HP Comanche is a worthy competitor to an M20C Mooney in many categories. Alas, a 1972 flood at Piper's Lock Haven, Pennsylvania, plant ended Comanche production and forced the company to consolidate its manufacturing in Florida. The Cherokee Arrow was already certified and—though it didn't perform as well—Piper's single-engine retractable marketing shifted to it.

Which is a shame, since the Comanche usually is thought of as a better airplane. In addition to the wing's design—laminar flow generally results in reduced drag—its cabin is wider than the PA-28 series and it has relatively simple systems. The only real problem with Comanches is—like so many of the types discussed in this roundup—they're getting old.

If that doesn't bother you—or perhaps your favorite mechanic

knows them intimately—any Comanche (other than the 400-HP version) offers great transportation value. The Arrow, on the other hand, is still in production. For less than \$60,000, you can get into a 1979 T-tailed Arrow IV (although we'd try to stick with the normal-tail/tapered wing Arrow III, and maybe save a few thou). For a lot less than \$60K, you can get an earlier Arrow II, with a slightly stretched cabin and the older wing. Either way, you'll end up with a basic, retractable PA-28 with very few ADs, one of Lycoming's more-bulletproof engines (the IO-360, with a 2000-hour TBO) and an airframe for which there are a wide variety of clean-up mods available. It's comfortable, handles well, mechanics are familiar with it and parts are readily available. Plus, its 72-gallon fuel capacity—22 more than earlier Arrows and their Hershey-bar wings—affords good full-tanks range and full-seats loading options. For 60 grand and a thorough pre-purchase inspection, it'd be hard to go wrong. That's why it's our bargain retractable.

**WHAT'S A BARGAIN?**

In this market, \$60,000 can buy a lot of airplane. The examples in the table below represent the most-recent vintage of the models we explored and, according to the *Bluebook*, are available at that average price. Craft with better-than-average equipment, a low-time engine, and/or fresh paint and interior may command more. Run-out examples will go for less, and you'll have the privilege of sinking into it money for improvements you simply won't be able to get out of it later.

Why not a Bonanza, Mooney or Centurion, instead of an Arrow? Age, mainly. Sixty-thousand-dollar Bonanzas and Centurions can be excellent aircraft for your mission, and the chances of finding a good one for that price remain high. But you should be able to find a much younger Arrow—or even a long-body Mooney—for the same money.

If airframe and engine times, and avionics are equal, we would go with the younger airframe. For \$60,000, it's hard to beat a well-maintained Arrow that's "only" slightly more than 30 years old.

## BARGAIN (UNDER \$60K) RETRACTABLES

SOURCE: Aircraft Bluebook  
Price Digest, Fall 2009

MODEL	YEAR	AVERAGE RETAIL	PRICE TREND	STANDARD ENGINE	STANDARD HP	TBO (HOURS)	AVERAGE OVERHAUL	MAX SEATS	UAG ISSUE
BEECH BONANZA S35	1964-1965	\$57-60,000	DOWN	TCM IO-520-B/BA	285	1700	\$30,000	5	JUL. 1999
BEECH DEBONAIR B33	1963-1964	\$54-57,000	STABLE	TCMIO-470-K	225	1500	\$30,000	5	JAN. 2009
BEECH SIERRA C24R	1983	\$45,000	STABLE	LYC IO-360-A1B6	200	2000	\$30,000	6	MAY 2009
CESSNA CUTLASS 172RG	1985	\$56,000	STABLE	LYC O-360-F1A6	180	2000	\$19,000	4	JAN. 2009
CESSNA CARDINAL 177RG	1978	\$47,000	STABLE	LYC IO-360-A1B60	200	2000	\$22,000	4	JAN. 2006
CESSNA CENTURION 210J	1969	\$57,000	STABLE	TCM IO-520-H	285	1400	\$35,000	6	JUN. 2009
COMMANDER 112	1977	\$51,000	STABLE	LYC IO-360-C1D6	200	2000	\$21,000	4	DEC. 2009
MOONEY M20C RANGER	1978	\$59,000	STABLE	LYC O-360-A1D	180	2000	\$21,000	4	JULY 2006
MOONEY M20F EXECUTIVE 21	1977	\$54,000	STABLE	LYC IO-360-A1A	200	2000	\$19,000	4	JULY 2006
PIPER COMANCHE 260	1966	\$59,000	DOWN	LYC IO-540-D4A5	260	2000	\$19,800		APR. 2009
PIPER ARROW IV	1979	\$56,000	STABLE	LYC IO-360-C1C6	200	2000	\$22,000	4	JAN. 2008

## EFB Flyoff

(continued from page 7)

### RMS VISTA EFB

As with our review of Flight Planners, the EFB from RMS Flitesoft took the bronze medal, but the gap between it and the leaders wasn't so large this time.

The in-flight program is called Vista and it gets good marks for simplicity. Buttons across the top switch between scanned sectionals, en route charts, selecting an approach plate and the VFR and IFR vector charts. Want an approach? Tap the approach button and you can choose from a list of specific approaches for many nearby airports. We liked the clear course line on the airplane icon, and the fact that terrain and obstacle status appear regardless of what page you're viewing.

Vista works a bit differently for tapping on the map as it matters which tool you have selected. While not a real problem, you'll sometimes will tap in vain until you realize you have the wrong tool selected. Vista is also the least optimized for control via fingers. You can still do everything, but some scroll boxes and such were hard for us to manipulate. Some functions require calling the windows menus which takes an exact touch or the stylus.

Vista has a unique trick called the Flight Panel. This window shows a terrain map, profile view and relative bearing to several key waypoints. It proved handy when calling for flight following or watching for terrain on the missed approach. Similar is the one-click emergency window

for a simple moving map showing the location of the nearest runway (complete with runway number) and critical data for that airport.

We also liked the simplicity and utility of the nearest function which displays nearest airport, VOR, intersection and NDB first and then lets you tap to see more of any of those items, including bearing and distance. Like Skypad, it automatically shows an airport at startup or after landing. Vista can display multiple maps and screens at once in separate windows, for an equivalent to the split screens on other platforms.

In the negatives column, subtle but important things are lacking in comparison to other units, such as nearest airports being highlighted on the moving map as you explore them in the nearest list (as Chart-Case does) or seamless integration of weather or flight plan editing (as Voyager does). You also can't easily view the flight plan directly in Vista. You must switch to Flitesoft, which is not optimized for the touchscreen. You can, however, create a new route in Vista from the moving map or the direct-to button. There were also some oddities such as an obstacle warning we got while dead center on a glidepath GPS approach.

The Flitesoft EFB uses the Asus T91 Tablet for its hardware. This unit is lighter than the 2Go, but it was noticeably slower in switching views. The screen also has significant glare in bright sunlight. The EFB is \$1200 for Flitesoft Pro (piston, low-altitude) and \$1500 for Flitesoft Commercial (turbine, high-altitude). A USB GPS is included. It's an extra \$50 for Bluetooth. XM weather is \$595 via Bluetooth. Data updates are \$238/year and \$338/year, respectively.

### FEEDBACK WANTED

#### AERONCA CHAMP



For the July 2010 issue of *Aviation Consumer*, our Used Aircraft Guide will be on the Aeronca Champ, a classic taildragger. We want to know what it's like to own these venerable classics, 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 Champs by May 1, 2010, to:

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### MORE TO CHOOSE FROM

Another contender in this showdown should be the AnywhereMap Duo, but the company could not get us one for testing by our deadline. We'll try and look at it in an upcoming issue. We'll also take a look at the Jeppesen EFB in a future article. The rumored adding of sectional charts to AV8OR Ace makes it a contender, and the advent of the Apple iPad and similar Android-based tablets are sure to shake up this market as well.

Our takeaway from this all is that if your back is already sore from hauling around three cubic feet of approach plates and charts, one of these solutions may be just the ticket for you. However, if your current chart and GPS solutions are functional, however, we think future offerings from these companies and others will be the ones that finally deliver on the EFB promise that has so far proven so elusive.