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The Aviation Consumer

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Garmin's Dilemma

The letters in this month's issue illustrate the dilemma Garmin finds itself in. I don't know if the company sees this from the inside, but it's noticeable from where I sit. Specifically, the new GTN series they launched this spring is striking some buyers as not that great, which is something we never heard about the GNS430 and GNS530 when they were introduced.

What's the problem here? I don't think it's all price, because these products cost a little more to install than did their predecessors a decade ago. Adjusted for inflation, they're close. I think it's perceived value, or lack of it. For the money, say some readers, these boxes just don't do enough more than the current generation of mapcomms do.

My colleague Jeff Van West and I were discussing this the other day and the first question that arose was, "Well, what else do you want these things to do?" If you're actually going to fly the airplane, you have to have some kind of interface with the equipment—you have to at least tell it what you want it to do. Isn't this part of the challenge and joy of flying? I always think about this when I see an ad for one of those luxury cars that will parallel park itself. 'Scuse me, I'm no Luddite, but when I get to the point when I'm satisfied with my car parking itself, somebody please take my keys.

There has always been a class of pilot/buyer to whom flying is just a means to an end—a way to get there efficiently and fast. Some small percentage of those owners would, if they could, have an airplane that they could program from a home computer, then just start the engine and sit there while the airplane did the rest. That percentage is probably larger now, but I doubt if it's large enough to constitute a meaningful market.

What I think Garmin has discovered is a sea change. A decade ago, buyers were willing to be shocked and awed by every new GPS that hit the market, they had the money and they would spend it. Now, they're more jaded, have higher expectations and if they have the money, they're damn picky about how they spend it. I'm not suggesting the GTN series is or will be a flop. But clearly, the reaction isn't what we've seen before.

This has interesting and unknown implications for the longevity and value of the legacy fleet and for the whole of GA. Many owners feel the grind of market forces chipping away at their expensive investments. A flat economy is one, uncertainty about fuel—prices and availability—is another. The aging of the pilot population probably has an effect, too, and more older pilots are selling out with fewer new ones standing in line to buy their airplanes.

With the GTNs, Garmin has set the clock ticking on the remaining life of the GNS navigators, of which there are thousands in the market. If owners don't see the value of upgrading, at some point, the sunset for those products will be in view. What's that going to do to legacy fleet value? It's almost certain to have an impact of some kind.

Whether we're looking at the frayed edge of accelerating depreciation or an opportunity that may hinge on how creative avionics dealers are in generous trade-ins and sales efforts for the GTNs. I've already heard from two dealers complaining that Garmin cut their margin on the boxes, an effective price increase that just gets passed to the customer, further depressing sales.

I suspect that they also don't yet have a sense of used values for the GNSs and are wary of making a $3000 mistake on a trade-in. From the dealers I've talked to, this is a ticklish place to be and if would-be buyers sense it, it's no surprise that many of them are sitting on the sidelines. —*Paul Bertorelli*

Garmin GTN Blowback

I recently purchased a GTN650 to replace my GNS480. Turns out the STC requires that I have a second GPS/navcomm in order to fly IFR. So I had to go with GTN750, remove the MX20 and SL30 to make room for the 750 and 480. Nobody at Garmin seems to want the public in on this. My avionics tech found out by reading the STC. This applies to composite airframes only. It doesn't make much sense since I have been flying IFR with a single GNS480. Anyway, I had to open the wallet up to the tune of $6000 more, which I was not budgeted for.

The PC simulator that comes with the purchase requires quite a bit of RAM and hard drive space to operate. It requires 5GB RAM and 2GB of free disk space. Seems none of my computers have this so I'm out of luck.

Bruce Jordan,
McAlester, Oklahoma

First let me preface this by saying that I'm the owner of a GMX200, GNS480 and GDL 69 combination. I was very interested in looking at the next generation from Garmin and had hoped to see it firsthand at Sun 'n Fun.

Unfortunately, the weather closed my window of opportunity to make my annual journey south. I was, however, fortunate enough to see a demo conducted by Garmin at a local avionics shop.

I would have to say that I was impressed by the touchscreen capability and the remote control of both the transponder and comm offered by the new series, but I was disappointed to find that it really does not offer any greater functionality than I have today in my current avionics setup.

With the exception of the touchscreen, the ability to drag a route and remote control of the comm, I can pretty much do today everything that these units do, as well as having the higher graphics resolution afforded me in the GMX200.

When looking at this and comparing what capabilities are available today through iPad applications, I

can't really see where one can justify spending these high dollars in today's airplanes.

Obviously, provided you have an adequate GPS/comm setup, you can pretty much do everything you want with these units by supplementing them with an iPad.

Without offering a generous trade-in program for your 430/530, I think Garmin is going to find it hard to push these units when there are so many other lower-cost solutions available. What I'd really like to see Garmin do is to offer their GX3 PFD for certified aircraft, with an MFD and onboard weather. That should be more than enough to support the glass panel enthusiast in today's marketplace.

Joe Palazzi
Wallingford, Connecticut

Have I Got This Right?

OK (sigh), after clearing out my airplane for its annual and when nearly getting a hernia hoisting the large 35-pound plastic bin full of Jepp plates and charts that I carry all over the U.S., I finally have decided to explore EFB solutions using my daughter's newly acquired iPad. I must say, I am a bit confused. Although it seems simple enough, as there are only three or four really solid providers of apps and data, the confusion comes from my being tripped up as to why the Jepp data is so much more expensive than the NACO data. I'm a Jepp guy, always have been, but if I'm reading this right, I can get ForeFlight with an annual subscription of NACO charts for $75, but the same in Jepp could cost more than $1000? I'm not that much of a Jepp guy!

I know you've covered this in recent issues, but here we are at the cusp of the real travel season and I'm not sure what to do. When I look at the price, I have to assume that you get much more with the Jepp. Otherwise, wouldn't Jepp lose all of its GA business? If these products compare favorably outside of the price points, what pilot wouldn't rather use the extra $900-plus for avgas? Help me understand this. What am I missing?

John Peruzzi
Via e-mail

You're not missing anything. That cost Delta is real and although we think Jepp plates have a superior design and typography, they're still just plates.

Tiedowns Revisited

I saw your article about tiedown stakes at Sun 'n Fun this year. It was unfortunate that it was incomplete. You may not be aware of what pilots are really saying about that whirlwind event in unsolicited blogs.

It looks like we have talked to dif-

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INDUSTRY REPORT

Flight Schools That Work: Top Service for Top Dollar

Schools that prioritize the customer experience and set prices high enough to leave a margin for profit are making money. Here's why this matters to you.

by Jeff Van West

If you're looking a feel-good piece about how flight training is on the rebound and we're on our way back to viable flight schools running side-by-side with every mom-and-pop FBO, you're reading the wrong article. (Actually, you're probably reading the wrong magazine.) Flight training never had a reputation as a cash cow, and the current economic climate hasn't helped that situation.

But there have always been, and still are, flight schools that run in the black. In fact, in just the past few months, we came across a couple not just getting by but expanding despite all the dire numbers of the current economy. We decided this was worth a critical look. Did these folks have some secret formula for success, or were they dumping resources into a temporary bubble that will collapse under it's own economic impossibility before the year is out?

It turned out that neither was true. The not-so-secret formula is the same it's always been: Find a market that can pay the price your bottom line requires and fully satisfy its needs. We saw several formulas to meet those needs, depending on the market niche. Not surprisingly, they largely mirrored the findings of AOPA's recent study "The Flight Training Experience."

IT'S A BUSINESS

"Flight schools fail for the same reason restaurants fail," Bob Miller of Bob Miller Flight Training told us. "They're run by cooks." Miller has been an outspoken horn for changing the way we do general aviation training. Having founded and run businesses before, he put his money where his mouth was and founded Bob Miller Flight Training (BMFT) in 2008. The first office was at Buffalo-Lancaster airport with one plane and himself as an instructor and owner. Now four instructors working at least part time take care of the teaching out of four locations in three G1000 Cessna 172SPs and one Skycatcher.

"We're charging 30 percent more than our competition," says Miller. That translates into $159/hour for the new 172s and $65/hour for the instructor. But even with steeper rates and only a mid-sized local population, BMFT's hours has steadily grown. "People assign value with price." But then, of course, you have to deliver on the value. Miller's staff does this by mixing training with cross-country flying and real-world experiences whenever possible. "We do a lot of ground training in restaurants."

BMFT has experimented with webinar training as an income stream and is looking at sending groups of students on multi-day training trips to warmer climes during winter months. He also uses the standard ploy of incentives to keep the revenue flowing. Instructors keep $100 for each $300 training kit they sell. If they were the primary instructor

for a student who eventually bought an airplane, that's $5000. BMFT has sold four airplanes in the last four months. "This goes back to the business owners that we cater to. They want to get to Chicago, Boston, D.C., New York or Philadelphia. That's faster in a 206 than commercially."

Lewis Liebert of Performance Flight draws on the much bigger market of New York City and agrees with many of Miller's tactics. His fleet of primarily Cirrus aircraft rent for $265/hour for an SR20 up to $325/hour for an SR22 Turbo. Instruction is $95/hour. On the same airport, you can get a G1000 172 for $172/hour and an instructor for $65/hour. "We've never lost a student to them, but we pick up students from them," says Liebert.

Liebert will tell you right away: "I'm not an instructor. The worst thing I can do for my company is to spend it in the air. That's far less substantial than what I can do on the ground to grow the company." He must be doing something right. Performance Flight's revenue has grown a fairly steady 20 percent per year. A one-plane operation in 2007 is now a rental fleet of 13 plus management of several more. They also pull revenue from sales and charter. "As we add more modules, they all bring in incremental revenue."

But would this scheme work outside the affluence of the Big Apple? "I've visited other Cirrus centers, and the common theme was undervaluing their aircraft," Liebert told us. "Where we would charge $500 for managing an aircraft, they would charge $200. They'd say, 'But people won't pay more out here.' I say, 'Well, they paid the same amount for the airplane.'" He's got a point.

COMMUNITY AND SUPPORT

There are flight schools doing well that aren't pushing the latest piston singles for the highest prices on the field. Chesapeake Sport Pilot (CSP) opened in 2007 at Bay Bridge airport in Maryland. Their first year saw 1263 hours with an average of three Light Sport aircraft online at any given time. By last year that was 3300 hours on eight aircraft. Are they the cheapest option in the area? Nope. But they do offer a cheaper alternative than renting four-seat equipment.

SPORT PILOT: NOT REALLY CHEAPER

We get letters at *Aviation Consumer* asking if Sport Pilot ratings really cost less than getting a private pilot rating. We put the question to Helen Woods, Chief Instructor for Chesapeake Sport Pilot (CSP). She says up front that it would save money versus a Private Pilot certificate for a given person just because it would take about 10 fewer hours. But then she's quick to add, "People usually don't ask if Sport Pilot is cheaper. They ask, 'How much is this going to cost me?'" To help with that more common (and, arguably, more relevant) question, she offers them examples of training times correlated to age.

We took a look at those numbers and noted several interesting trends: Two thirds of the sport pilot starts were over the age of 40. Half were over the age of 50. Not surprisingly, the trend is for more training time for older pilots in a slightly geometric increase from the age of 40 up. CSP's sample size is small, but it's perfectly in line with the anecdotal information we've received from several other schools.

It's also undoubtedly skewed by other factors. There's a difference in goals. People coming into aviation in midlife are less focused on completing the rating and travel than enjoying the ride. So the 20-hour sport pilot is probably as rare as the 40-hour private pilot outside university Part 141 programs.

Most importantly, though, the numbers don't turn people away. While training cost is a factor, honesty is a powerful trust builder. Tim Adelman, Co-Founder of CSP, pegs their attrition rate for students at about 30 percent—less than half the national average. "That's mostly due to economics. Maybe one percent wanted a different school. I can't quantify how many restart, but there were six in the last month who came back."

On the flight school side of the balance sheet, Light Sport aircraft save on fuel costs, but that's about it. When we looked at LSA viability as trainers in July 2010, we found flight school fuel burns for Rotax-powered LSAs was consistently about 3.3 GPH. Cessna 152s in training ops burn about 5 GPH on average. Maintenance costs were equal to or higher for the LSAs, though, and insurance was reported as consistently higher. This reflects in the rental prices we see. Light sports tend to rent for $95 to $120/hour. Cessna 152s in the same markets often rent for $5-$15/hour less. But many renters are happy to pay the extra for the privilege of flying new equipment.

One other phenomena several schools told us both in this research and our look specifically at LSAs last year is that some instructors tell us it takes longer to master some of the basic stick-and-rudder skills in the LSAs than a slightly heavier, less control-sensitive Cessna 152. But the final outcome is a better stick-and-rudder pilot.

So we'd have to say the bottom line is that Sport Pilot doesn't cost less. It just "costs different." But for the older demographic with a goal of recreation and therefore in no hurry to rush training, that might be just fine.

SIMULATORS MAY BECOME CORE TOOLS FOR GA

If you ask Nick Frisch what went into the turnaround he orchestrated for Galvin Flying during his tenure, he'll point to simulator training as one key factor. When used well, sims have the potential to cut two ways on the bottom line: They offer a steady revenue stream at lower maintenance costs relative to the airplane, and they offer a way for customers to get better training in fewer hours—if used well.

Frish says this requires sim-centric thinking. "You don't let people get away with a mistake in the sim." If they miss a step, such as incorrectly pitching up too much on rotation, you stop, back up and do it again. Pretty soon they get it right every time. He likens this to cutting a piece of linoleum: Try it without a straight edge and you get several messy lines that eventually make a ragged hack about where you wanted the cut. Make ten slices with a straight edge in one place and by the eleventh slice you don't need the straight edge. The blade will stay in the groove. Well put.

Not surprisingly, the schools that integrate the sims as part of a structured program say they see a real payoff. But the majority of schools see sims primarily as a way to get through the winter months when flight times drop.

We think there's a missed opportunity here that may become more critical for the flight school of tomorrow. We're at a crossing point where cheap computer technology has spawned both an increasing prevalence of high-tech cockpits—and the need to teach far more complex procedures—with the potential for less expensive and more capable simulators. We say "potential" because we only know of one company delivering on this promise.

Redbird Flight Simulations is pushing the envelope for cheaper sims. The numbers are significant. Redbird's full-motion systems (FMX) sell for under $80,000 and tabletop ones (TD) for under $8000. These are prices even a smaller school can absorb and amortize. They must be because Redbird has shipped 174 FMX systems in just over two years and ships about one TD per day. In terms of units, they are the largest selling simulator in the world. Redbird is also using voice recognition for automated ATC and partnered with King Schools to create complete lessons

where a student watches a training video on the screen and the immediately practices that maneuver in the sim, complete with critique of their performance.

An important detail here is that we're using the word "simulator" incorrectly. Even with motion and wrapping visuals, current standards limit the Redbirds to Advanced Aviation Training Device (A-ATD) status, limiting their use in logged training time. A factor in this is that Redbird achieves its low cost by reverse engineering the glass panel displays and GPS navigators it uses, rather than buying the actual hardware that goes in real airplanes.

Redbird is putting skin into the game to possibly change the FAA's mind and building its own Part 141 flight school in San Marcos, Texas. One product will be a Private Pilot License for $9500 using new G1000 172s—but only after learning in a syllabus built around the simulator. There will also be a lab to study the utility of sim training in GA and a "flight experience center," similar to NASCAR experience centers.

We think it's a safe bet they'll find tangible success in both lower training times and lower training costs. There's plenty of data showing that even using Microsoft Flight Simulator on a home computer makes students pick up real airplane flying faster. Offloading some of the time spent just grinding through procedures and systems training to a simulator means the balance of airplane time can shift to more trip-centric training. Sims clearly have an advantage for scenario and emergency training, and they do offer a way to keep your head in the game when it's too nasty to fly. Keeping pilots alive and engaged is clearly good for the industry.

But it's going to take some schools putting the simulator at the center of the curriculum—just the way it's done for turbine gear—to make a change in the bias to time in real airplanes and prove a sim in the rental fleet makes good business sense. Given that a 172's automation rivals that of some jets, we think factors are finally here to make the sim shift in GA.

SOCIAL MEDIA SHOWS PROMISE AND PITFALLS

"We did Groupon," Performance Flight CEO Lewis Liebert told us. "We'll never do that again." For those of you who think Groupon sounds like the seafood special of the day, let us fill you in. Participants in Groupon offer a product or service, a discovery flight in this case, at a discount. Groupon then sells that discounted product to its list and pockets 20 percent of the sale. For Liebert, that turned a $299 flight into $143 in revenue once all the discounts came out—a loss for Leibert unless only a small percentage of the buyers actually redeem. That might happen with a $20 dinner, not a $299 intro flight.

Or, maybe it would. Bob Miller doing the Groupon offer in Buffalo, N.Y., rather than the NYC metro area, saw less than a third redeeming and it turned into a profit as well as an advertising tool and potential stream of new students. Maybe the coastal New Yorkers are just more keen on getting the deal they paid for.

The fastest growing segment of Facebook is said to be the over-50 set. A subset of that crowd is flight training's fattest market right now, and Miller is hitting that avenue heavily. "We can target our adds by demographic, so they're read by college educated males, ages 35-65," says Miller. "I got letters from no less than five angry female pilots when I wrote about this in my newsletter, but at $1.59 every time the ad is clicked on, I have to go for my best market."

Miller also uses the Facebook page to follow up on every intro flight. "We sold 400 $99 discovery flights last year. We lose money, but we snap photo and put it on our Facebook page. They like it, now we're on their newsfeed." Facebook friends see the post, like it, and it spreads. Miller hasn't been able to get hard data on how much business it has brought in, but he's confident it's been a net gain.

Does Liebert use Facebook? "Many of our clients aren't using social media. They just don't have the time."

They also keep clients engaged. Tim Adelman, co-founder of CSP, says, "We have a community nature. We encourage people to come out. We have impromptu barbecues. The 'fridge is full. They feel they're part of the aviation community." CSP's Chief Flight Instructor tracks each student and helps ensure people's progress. Regular follow-ups from someone high in the company to check in during and after training was another common theme in successful schools. CSP has several independent, high-time instructors. Adelman says, "The customer-instructor relationship is extremely solid."

Adelman also points to CSP's mechanic, Jamie Shimer, for reducing aircraft downtime and making the double impact on the bottom line of revenue-generating aircraft and customer satisfaction.

What about trip training? "We don't muddy the waters by going to Ocean City for lunch," says Adelman. But CSP does sponsor flyouts, including taking LSAs into Dulles International.

STELLAR SERVICE AND STAFF

If there's any surprise in this research it's that there's no surprise. None of this is revolutionary thinking. Case-in-point was our talk with Nick Frisch, who turned around two struggling flight schools, Galvin Flight Training in Seattle in 1998 and Florida Institute of Technology in 2007. Both went from marginal operations to top-notch facilities turning profits and drawing international business.

"I tend to focus on the customer experience. Businesses need money to operate. That comes from customers, company subsidies or debt. My goals is to have the money come exclusively from customers." Frisch used the same tools—replacing aging aircraft with newer ones, targeted marketing, realistic prices that met the bottom line, and rewarding and developing his staff. But he points to the last one as the most important because they control the customer experience. "I had someone tell me once, 'Nick, people go where they are welcome, and stay where they are appreciated.'"

Investing in staff training was another common theme. The successful schools not only paid their staff well, they paid for the staff training. Luke Lysen of The Flight Academy (TFA) put a number on it. "It costs us about $10,000 to fully train an instructor." That's commitment. But it's paid back in voluntary loyalty and the quality instruction that comes with that kind of expertise. Lyson is the first to point out his margins are thin but, "2010 was our best year ever by any metric—gross, net, or hours."

NOT EVERYONE'S GAME

The cold reality that peeks its ugly head out from every corner of this research is that not every zip code has a market big enough or affluent enough to support a flight school, and that not everyone near a flight school with a dream of flight will be able to afford it. Even for schools that target the less affluent segment, they tend to be successful pitching themselves first on quality within that segment. "I think there's a big effort by AOPA to pitch flying as everyman's activity." Liebert said. "It's not."

Lyson put it another way, with a sad lilt of resignation in his voice. "I had client say to me once, 'You can be Walmart or Tiffany's. There's nothing in between.'"

The relative bearing, distance and altitude shown on the display is also spoken on the audio alert. When interrogating Mode S targets, compatible displays can include squawk code and N-number on the traffic tag.

Avidyne TAS600: Still a Top Choice

A mature and solid-performing traffic minder readies itself on the ADS-B bandwagon. But even as is, it remains one of our favorite traffic systems.

by Larry Anglisano

We've flown and installed enough Avidyne TAS systems to confidently hail them as top values in active traffic alerters. We even proclaimed it the best traffic system in our 2008 Gear of the Year award.

CHECKLIST

- ⊕ Many models to match aircraft performance
- ⊕ Many display interfaces to choose from
- ⊖ Complex installation and ADS-B-in capability not a convincing value

It was Ryan that engineered and birthed the twin-antenna 9900-series TCAD back in the 90s. When Avidyne and Ryan merged, the popular 9900BX became the TAS600. With a liberal display potential, it's been a brisk seller and popular option for active traffic alerting.

The latest evolution in Avidyne's TAS logically promises ADS-B functionality, a refreshingly lower price tag and retains a notoriously complex and critical installation process that will make or break performance.

STEPPING UP PERFORMANCE

If the TAS600 product line seems complex, that's because one size doesn't fit all. Avidyne offers various flavors of the TAS600 to match the performance and complexity of the aircraft. Avidyne recently obtained AML-STC approval for the TAS line and revised the AFMS, making it easier for shops to sign off the installation with less help from the FAA. But it's up to the shop and the owner to determine how much system they need or want to pay for.

The entry-level TAS600 works to 18,500 feet and seven miles. The next step up is the TAS610, which is good up to 25,000 feet and has a 12-mile range. Then there's the TAS605 and TAS615, which boast a 55,000-foot operating ceiling and 13- and 17-mile ranges, respectively.

The top-of-the-line TAS620 (née the Ryan 9900BX) has a 21-nautical mile range, +/- 9900 feet of vertical scan and a 55,000-foot ceiling. Its target market is speedy jetprop singles up through bizjets and transport helicopters.

It's not until you get halfway through an install that you'll realize just how complex the system is. Much of the complexity surrounds the installation of top and bottom blade-style antennas. Earlier TAS systems like the L-3 Skywatch used single, top-mounted antennas. While a simpler install, single-antenna systems miss traffic due to the aircraft's own fuselage getting between the antenna and some targets.

Aside from the dual antennas, technicians need to find space to accommodate the eight-pound remote processor. It measures nearly 12 inches deep with all of its connectors in place and sits 7.25 inches wide.

Still, the Avidyne TAS processors are lower profile and lighter than the competition, including the L-3 Skywatch, which has no ADS-B option, and Garmin's GTS800-series TAS. Compared to the ADS-B capable GTS820, Avidyne's TAS offers a slight edge in installation by not requiring an external amplifier and having fewer RF connections to the remote processor.

MODEL	RANGE	SERVICE CEILING	RELATIVE ALTITUDE	HEADING INPUT	MARKET SEGMENT	ADS-B UPGRADE?	PRICE
TAS600	7NM	18,500 FEET	± 3500 FEET	NO	ENTRY	YES	$8,490
TAS605	13NM	55,000 FEET	± 5500 FEET	YES	MID	YES	$10,990
TAS615	17NM	55,000 FEET	± 10,000 FEET	YES	HIGH PERF.	YES	$14,990
TAS620	21NM	55,000 FEET	± 10,000 FEET	YES	JETS	YES	$20,990

A modern and healthy transponder is a prerequisite to a TAS600 installation. The system uses a transponder coupler, which eliminates the display of the host aircraft as a traffic target. If dual transponders are installed, then a second transponder coupler is required.

You'll need to display the traffic symbology somewhere, and Avidyne impresses on this front. The healthy variety of compatible RS232 and ARINC429 interfaces include almost every GPS or MFD in the Garmin line, Sandel's EHSI, Aspen's PFD and MFD, Honeywell's KMD series, Universal, Chelton, and, of course, Avidyne's own Entegra and EX600 MFD.

SMART OPERATION

The TAS600 uses easy, TCAS-like symbology. Non-threat traffic that's greater than ±1200 feet and beyond six miles is depicted as open white diamonds. A proximity alert means this becomes a filled white diamond and warns the threat altitude is within 1200 feet vertically and six miles laterally. The dreaded wiggle-in-the-seat traffic alert (TA) shows as a yellow circle and warns that traffic is calculated on an intercept course of the host. Descending or climbing arrows next to a traffic tag depict a target climb greater than 500 feet per minute.

We like a feature that Avidyne calls Heads-Up Audible Position Alerting with ATC-like callouts of bearing, relative altitude and range. These appear both on screen and over the audio system. We're convinced that a "Traffic, six o'clock, low, two miles" callout, for example, allows for quicker target acquisition once eyes go outside the cockpit. Compatible displays with RS232 interfacing can display N-number and squawk code tags for Mode S targets. This is surprisingly helpful for situational awareness when a controller is working conflicting traffic.

A ground mode eliminates nuisance audio callouts by muting the audio and suppressing display of other taxiing aircraft. Airborne targets are still shown. The system automatically comes out of ground mode climbing through 400 feet AGL.

ADS-B POTENTIAL

Avidyne advertises a $2000 ADS-B upgrade for the TAS600-series. It seems the appropriate answer to Garmin's GTS800-series TAS/ADS-B. Adding ADS-B would round out Avidyne's already capable system, but the proposed upgrade is not full-up ADS-B. That said, it has some advantages of simplicity and cost.

The TAS600A-series, which Avidyne says will be available by year's end, lacks ADS-B output. This means it won't get any data streamed from ADS-B ground stations; it can only paint line-of-sight targets transmitting their location. Because of this, there's no need to equip with a 1090ES transponder. But by that same token, this won't make your aircraft ADS-B compliant, either.

The system also needs a tie to an onboard GPS system for proper depiction of traffic in relation to the host aircraft.

We think even a limited system offers reasonable valuable for a few reasons. Seeing a target with ADS-B rather than TAS means a much more accurate position and vector for that target. But until more aircraft have ADS-B, if you don't have TAS, you're dependent on data uplinked from the ground stations to see any other traffic. Think of the TAS half of the system as a fallback, displaying all transponder-equipped aircraft that don't have ADS-B Out (or have a UAT for ADS-B, which Avidyne's system wouldn't see, either). The TAS-600A can display both ADS-B and traditional targets simultaneously.

Avidyne told us that in non-congested airspace, their airborne ADS-B might see 200 miles. While you

The TAS requires connection to the audio system and muting, but there's an option for automatic adjustment of sensitivity near airports via landing gear or airspeed sensors. There's also a radar altimeter input for sensitivity automation on approach.

TAS BEATS TIS IN ACCURACY

A look at the real-time traffic-painting TAS performance reveals some sizeable advantages over lesser traffic alert systems, including the lower cost but popular Mode S TIS datalink traffic systems (not to be confused with TIS-B, which is part of ADS-B-in, which is a completely different animal). Fly with the two systems playing simultaneously on the same screen and you'll see why.

TAS technology was born from jet-age trickle-down, TCAS 1 technology and like TCAS, boasts up to 30-second collision warnings at up to 1200-knot closure speeds while interrogating other airborne transponders up to 56 times per second. TAS theory of operation has always been a mystery and to help interpret what you're seeing on your traffic screen, you need to understand some basic theory. The vertical separation of the host and intruder is determined by comparing the decoded altitude replies from threat targets to the host aircraft altitude.

The displayed range of the target is calculated using radar time of arrival technique. Bearing to the traffic is determined using the system's dual directional antennas, one placed on the top and the other on the bottom of the aircraft. The intruder's altitude data is referenced to pressure altitude (29.92 inches) just like a Mode C altitude encoder, thus traffic separation is not dependent on the altimeter setting.

While TIS datalink traffic offers the advantage of a far simpler installation and lesser cost, there are issues. One is target lag. Because there's a delay in receiving and processing the target data from the ATC ground stations that transmit it, the azimuth and range of TIS targets is often latent, and target jump is noticeable. The TAS systems won't exhibit this. Compare the targets painted by a TIS and a TAS system, as shown here, and you'll see the difference in position. TIS also had self-alert issues that occasionally cropped up, but this issue was improved somewhat with a software change in the ground system.

TIS has some advantages over TAS. Mode S datalink arguably detects targets at greater range than active systems because it relies on ATC radar. The TIS range display is nominally seven miles, but the system can see targets beyond that range. TIS symbology includes a small vector line that gives some sense of target direction, based on ATC tracking data. You won't see that on a TAS system.

won't see this kind of performance in busy space—50 miles is more like it—it beats the range of the average TAS system. Avidyne's processors have a maximum output of 42 watts, which is throttled back based on airspace congestion.

In talking with Avidyne's Ted Lester, the company's ADS-B lead guy, we sense that Avidyne has a diverse line of ADS-B products in the works and adding ADS-B to the TAS system is just a start. The flat rate upgrade has appeal, but we wish Avidyne would also guarantee that the system would be upgradable to receive the ADS-B ground stations as well as ADS-B air-to-air. So far, they won't commit to that.

CONCLUSION

With the L-3 Sky497 Skywatch at $15,990 and Garmin's entry-level GTS800 at $11,090, the TAS600 beats the competition in price for light GA. The TAS600 is also arguably the smallest and lightest.

Reliability of the TAS600 has been good, but not flawless. Given the flat-rate repair cost of the system, we think purchasing Avidyne's FlexCare extended warranty coverage is worth considering. It covers the system for one, two or three years for $500, $750 or $1000, beginning when the two-year warranty expires.

If there's a wart with the TAS600, it's tackling a complicated installation that for a basic retrofit could mean writing a check that sails toward $15,000 in some applications. But that's a complexity in all TAS installations where antenna placement is critical, difficult and fraught with interference issues. Owners of airplanes certificated to fly above 18,500 feet will have to pay extra for a higher-tier processor.

Still, the recently reduced price of $8490 for the entry-level TAS600 helps tame the install burden, which in our view makes the TAS600 a top choice in active traffic systems with promised ADS-B function in the wings.

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Gear of the Year: iPad Apps Rule

While it hasn't revolutionized the cockpit, the iPad has inspired dozens of useful utilities, so it's our top product of 2011.

That not-so-faint hissing sound you hear is us reacting at the slightest suggestion that we are Mac fanboys. We are, if anything, washed-in-the-blood cynics when it comes to the great bloated gust of hype that surrounds everything to do with Apple computers and products.

But we're also realists and fair to a fault, so when we see practical, meaningful products of any kind, we think the nod is due. So this year, we are naming aviation applications for the iPad as our products of the year.

The Aviation Consumer PRODUCT OF THE YEAR

Please just shoot us if we use the phrase "game changer" applied to anything, most of all a computer. We prefer to think of the iPad and the dozens of useful aviations apps it has spawned as a substantial and useful contribution to cockpit information management. But it extends beyond that, since iPad apps also inform things like test taking, flight planning, weight and balance and so on. If it's an aviation task, there's probably an app for it. We think these gadgets are worth considering. (Just don't call us fanboys.)

BEST APP: FOREFLIGHT

While we're drowning the iPad itself in faint praise, worth mentioning is what we think is the best overall, most useful application: Foreflight.

This app is as strong for what it does as for what it doesn't, which is to overreach with a bunch of useless features most owners would never use. It's a good, easy-to-use general flight planner, chart manager and weather getter. It does these functions superbly, without stumbling all over itself trying to do everything else. In app writing, restraint is to be admired. See www.foreflight.com.

LSA OF THE YEAR TECNAM P2008

Reviewing LSAs is sometimes like being the ice cream critic at a Baskin-Robbins. There sure are a lot of these things. We flew several this year, but the one that stands out is the Tecnam P2008.

It's one of the most refined LSAs we've seen, albeit expensive. Tecnam offers no apologies, since they are plying the high-price stratum where owners want—and can afford—amenities like premium interiors, autopilots and glass panels, all of which the P2008 has.

Coming from a company that has built certified aircraft in Europe for years, the P2008 shows excellent attention to detail and handles and flies beautifully. Tecnam has spared no effort on the interior and the avionics packages are top drawer. For more, see www.tecnam.net.

MOST PROMISING INNOVATION: LYCOMING IE^2

If airframers and engine manufacturers can count on one thing, it's that customers will say they want one thing, then refuse to buy that very thing when it's introduced. And so it has been with electronic engine control systems, which have failed to take off.

Lycoming's ambitious IE^2 system may change that. It has more sophisticated hardware and software than previous attempts, appears more mature and, we suspect, it will soon have an OEM launch customer or two. If the company can just get its

foot in the door with a few Cessna models, we predict this project will have legs, to which we say: It's about time. See www.lycoming.textron.com.

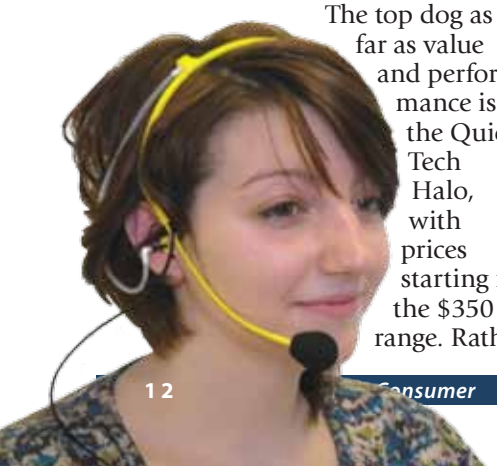
BEST ENGINE MONITOR: EI MVP

Not that long ago, dancing orange bars were the high-tech latest in engine monitoring technology, but now, these devices are so 1999. They've been replaced by large-format monitors that provide lots more information and are less obtuse to interpret.

The three major competitors, JPI, Flight Systems and Electronics International all make excellent large-format monitors, but we're picking EI's MVP-50 as the top choice because shops tell us it's easy to install, exceptionally well supported by the company and, most important, it's highly customizable and configurable. To find out just what you can do with the MVP-50, see www.buy-ei.com.

BEST IN-EAR HEADSET: HALO

We think many owners don't like so-called in-ear headsets because they simply haven't tried in-ear headsets. But it's our job to try such things and when we compared the major players in this market, we were impressed.



The top dog as far as value and performance is the Quiet Tech Halo, with prices starting in the $350 range. Rather than a skull-crushing spring headband to shut out the cockpit din, these devices rely on a rather more gentle foam earplug through which the audio signal is passed via a hollow plastic tube. Although an acquired taste, users insist these headsets are far less fatiguing without giving up noise attenuation. Check out www.quiettechnologies.com.

BEST CO DETECTOR: BW GASALERT

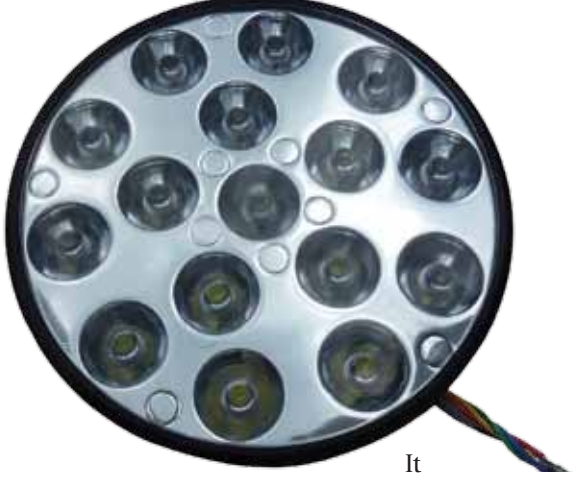
Do you really need a carbon monoxide detector? Depends on where your personal demons live. If any of them are hanging out there down by the muffler and heater shroud, might we suggest you do need one?

Cutting right to the chase, this review was easy, since the BW GasAlert Extreme was the walkaway winner of our CO gas chamber competition. The product is small, light and has excellent low-level sensing. For about $240, it will keep the cabin safe from an admittedly rare but still deadly hazard. Find out more at www.gasmonitors.com.

LED LANDING LIGHT: AEROLED SUNSPOT

In case you haven't noticed, virtually every new LSA equipped for night VFR has an LED landing light, and it's not because they're cheap. LED lamps are long lasting, bright and efficient, and the industry is making great gains in making them even brighter. Even some certified aircraft are turning to LEDs. They're simply the light of the future.

We tested all of the aftermarket LEDs we could find and AeroLED's SunSpot emerged as the victor in overall value. It will fit into the same space as the ubiquitous GE4509 that most aircraft have as a standard landing light.



It also has a built-in flasher and wig-wag circuit, if you're inclined toward multiple installations. The only drawback is that approvals for some aircraft may be difficult, although AeroLEDs will help with this. Check out the company's full line at www.aeroleds.com.

AVIONICS COOLING FAN: SANDIA AEROSPACE

If you have to ask whether you really need one of these things, you've probably already fried something. But cheer up, with a Sandia Safe fan, you can at least blow the smoke away.

The fact is, avionics stacks still need cooling, especially considering how warm even the best TFT displays can run. For as little as these fans cost, you might as well get the best and Sandia makes five models, so there's no problem finding one to fit your aircraft. Find out more details at www.sandia.aero.

BEST BARGAIN HEADSET: ALURA SSB ANR

Nice as it is to use a Bose or Lightspeed Zulu, many pilots simply don't need the top-of-the-line. That's where the Alura comes in. At $299, it's a third the price of the premium ANR headsets and although it doesn't perform as well nor is

it as comfortable, for that price, we wouldn't expect it to be.

But it's quiet and comfortable enough. It's built tough, so broken headbands or mic booms shouldn't surface during normal use. It automatically turns its ANR on and off to save the battery, and the company is small and has already improved the model in responsive to user comments.

Get the details at www.alurahead-sets.com.

BEST VHF PORTABLE RADIO: SPORTY'S SP-400

The portable VHF radio market used to be much bigger than it is now, but there are still plenty of radios to pick from. And the top pick, according to our comparison trials, is Sporty's SP-400, a follow-on to its popular and top-selling SP-200, a first-class radio in its own right.

The SP-400 has some impressive features you might never use—such as localizer capability and VOR reception—but it also has an excellent two-way radio with good RF and audio performance.

By our standards, these meet the primary requirements for a portable VHF, which is good performance as a backup radio and for use on the ground.

At $299, the SP-400 is competitive with other radios but delivers more for the buck. Check out the SP-400 at www.sportys.com.

BEST VALUE IN AUTOPILOT: S-TEC SYSTEM 30

Along with everyone else, we noticed a big sea change after the financial meltdown of 2008. Obviously, the OEM market tanked, but owners got a lot more picky about value when doing upgrades, including the avionics work that still represents the lion's share of routine aircraft improvements.

Autopilots are one of these upgrades and expense wise, they're near the top of the list, right behind engines. The reason is that they involve major surgery to the airframe and the more suited the autopilot is to minimize this, the better. So when the shop says, "That'll be $40,000 for the autopilot install," many owners ask, "What other options do I have? We think the S-TEC System 30 is one of these and the best-value option in autopilots.

The installed price is reasonable, the system will fit into about anything and while the System 30 doesn't have every feature, it has enough to earn it our top value recommendation. For more, try www.s-tec.com.

BEST MULTIMEDIA TEST PREP: SPORTY'S

When it comes to prepping for a written, the market is choked with choices, so much so that it's hard to know where to start. Triaging the choices, we compared the multi-media options for the private pilot exam and pegged Sporty's as the top.

Not that those from King Schools, Gleim, Jeppesen and ASA aren't worthy, but the Sporty's course delivered the best combination of technology, pacing and price/value, in our view. See www.sportys.com for more.

LSA FLIGHT TRIAL

Eastman's CH650: Son of Zenith

Based on the CH601, the design is sporty and fast and has a new, beefed-up wing structure.

For taxonomy purposes, the aviation press seems to sort light sport aircraft into two broad categories—fun flyers and cruisers or "go-places airplanes." Ostensibly, the divider is speed. Fun flyers like the Cub clones cruise a little faster than 100 MPH and the cruisers seem to manage as much as 125 MPH. Not a huge difference to be sure, but enough to make short VFR cross-countries tolerable, if not expediently routine. Another way to look at the sorting of LSAs is sports car versus utility vehicle.

Into this marketing equation, Eastman Aviation has inserted its CH650 low-wing LSA, a cruiser that's decidedly on the sports car end of the spectrum. If you've noted a certain sameness in the look of low-wing cruisers, there's a reason for it. Against the limitation of a 132 MPH limit, there are only so many places a design

The CH650 has superb cockpit visibility, top photo. Raked back seats, middle, mean that the long stick actually rises to near chest level, but is far enough forward so that your hands can be braced on your knees. (Previous page: That's actually a CH601, with a smaller canopy and slightly different vertical fin.)

can go and the CH650 has been there—for years.

As we reported in the June 2011 issue on Eastman's unique utility model, the CH750, the CH650 springs from the prolific Chris Heintz, whose Zodiac line is well known in the kit industry, with hundreds flying. Hientz's offshoot companies—Zenair in Canada and Zenith Aircraft in Mexico, Missouri—are as close as the amateur-built and LSA segments get to a multi-national airplane company, albeit a modest one. As have other manufacturers—Kitfox and RANS, for example—Zenith is plying both the experimental and LSA side.

But Eastman is not a Zenith daughter company, rather an independent entity that simply buys subassemblies from Zenair and assembles them under its own brand, sort of like Wal-Mart's aspirin actually being made by Bayer.

As detailed in the sidebar on page 16, Eastman is located at Heart of Georgia Airport in Eastman, Georgia, a couple of hours south of Atlanta. It occupies a hangar that includes a paint shop. If the CH650 looks like a Zenith 601, it should. These are essentially the same airplane, albeit with minor modifications. The most noticeable is a larger canopy and a more swept vertical stabilizer/rudder assembly. (Like other Zenith designs, the vertical assembly pivots on a post; there is no separate, hinged rudder structure.)

Unlike most other LSAs, although certainly not unique to the industry, the CH650 is powered by a Continental O-200-D rather than a Rotax. According to Eastman, there are two reasons for this: One, they prefer a traditional aircraft engine and two, they're pushing the idea of an American-made LSA, never mind that a Chinese conglomerate owns Continental and Zenair is in Canada. We think "North American" applies and we give the company credit for trying.

Construction wise, the CH650 is typical of all the metal LSAs in that it's riveted aluminum and, typical of Zenith designs, it's as light as it can be structurally, a fact that may have gotten the design into trouble after a series of CH601 fatal wing failures. (See the sidebar on opposite page.)

AC TV

For a video demonstration of the CH650, log on to www.avweb.com and select the video index. Scroll down to the CH650 or CH750 video demo.

And the design needs that weight saving, because by using the O-200-D, it gives up some weight advantage to the Rotax-powered LSAs. Empty weight for the CH650 is typically in the 850-pound range, which is on the heavy side of average for other LSAs we've tried. It carries 30 gallons of fuel, 28 usable, for a practical endurance of 3.5 hours or so, with reserve, at high cruise settings. Call that just short of 400 miles in still air.

It's Eastman's view that the CH650 can be flown under IFR by a properly trained pilot and with the airplane equipped accordingly. That means fitted with TSO'd instruments and radios and, oddly, that means steam gauges. The Dynon glass the airplane would typically be equipped with—the D100 and D120 paired, plus a Garmin 496, an SL40 comm and a GTX327 transponder—aren't TSO'd, so IFR isn't technically legal. (The SL40 is TSO'd.) We wonder how many owners honor that technicality in an airplane that's otherwise so capable. It's telling that none have been ordered with steam gauges because owners have declared a preference for glass.

BRS parachutes are also an option, exacting a 40-pound hit on payload. It's our impression that BRS hasn't seen much uptake in the LSA segment, less because of expense than payload penalty. Speaking of expense, the base price of the CH650 is a reasonable $99,500. But typically equipped, it sells for what has become the sweet spot in the LSA market, and that's between $112,000 and $120,000, but much higher if you throw all the options at the invoice.

THE WING FIX

Designers of both kit-built aircraft and LSAs have an advantage over certified aircraft: To save weight, they can whittle the structure down to the absolute minimum, but that's a knife that cuts both ways. Zenith may have discovered just that after several wing failures in the CH601 that resulted in six fatal accidents in the U.S., plus some in Europe.

The FAA declined to ground the CH601 fleet, but on its own, Zenith stepped up and engineered its own fix, which involves stiffeners in the wings, some doubler brackets, an external strap at the wing attach point and a beefed-up spar. Although these aren't mandatory, most owners have performed them.

Zenith made these modifications available to LSA owners and essentially split the cost of having them installed on the aircraft. Eastman's Heart of Georgia shop has done nearly 60 of these aircraft (all 601s) and all of the new CH650's being delivered have the improved wings.

FLYING IT

Although most of the low-wing LSAs look like clones at a distance, they definitely don't fly the same nor are the ergonomics identical. That particularly applies to the CH650 from the moment of ingress. As you can see from the photo at left, there's little space between the front edge of the seats—non-adjustable—and the bottom lip of the instrument panel. Further, the seats rake back at a sharp angle; they're not quite F-16 recliner seats, but they're close. Taken together, this produces an odd effect: The top of the stick comes to well above the mid-chest area, but it's so far forward that the reach feels similar to other aircraft. But it's definitely a higher stick. The panel is also a long reach and maybe a bit of a lean forward. We wouldn't call it uncomfortable so much as different and certainly nothing like the Sport-Cruiser or even a heavier two-placer like Diamond's DA20.

Visibility is superb, although due to the low seating angle, the cockpit walls hit high on the shoulders. The baggage compartment, which is adequate if not generous, is an easy-to-access shelf behind the two seats. That makes it perfect for grabbing stuff during cross-country flight. Most of the low-wing, canopied airplanes are bake fests on a hot day, but the CH650 is not so bad. It has an effective adjustable sunshade inside the canopy and the cockpit itself is well ventilated with blast vents. You can also taxi with the bubble propped open. (It hinges from the front.)

Most of the LSAs use differential braking, but the CH650 (and its stablemate 750) actually have steerable nosewheels through a rudder/bungee arrangement and it shows. Both airplanes steer with laser-like precision on the ground, a refreshing

WHO ARE THESE GUYS?

We continue to cling to the notion that the great LSA shakeout is looming somewhere in the future, so when shopping for a new one, the wise buyer will compare companies just as carefully as the airplanes themselves.

As we reported in the June 2011 issue, Eastman Aviation is the latest iteration of several companies that have occupied the same hangar where Eastman now is. The first was Aircraft Manufacturing and Development, a company that was building the CH2000 Alarus, a light, two-place certified trainer, also a Zenith design.

After an ownership change, the company became a second AMD—Aircraft Manufacturing and Design, and moved into the LSA market, tooling up to build the CH601 LSA, which eventually evolved in the CH650. During that iteration, the company was bought by Bill Bryce Jr., a Florida-based aircraft dealer and investor who self capitalized it to form Eastman Aviation. Bryce told us his overriding commitment is to build a competitive LSA on U.S. soil and he sees this as critical to the survival of general aviation. Not for nothing is the CH650 also called the Patriot Cruiser. Despite a flood of competition from Eastern Europe and, in the Cessna Skycatcher, China, Bryce sees this as an achievable goal.

He has an inherent advantage in keeping costs down in that there are few employees at the Eastman hangar. The sub assemblies are shipped in fully formed from Zenair in Canada and it takes only a few skilled workers to put them altogether, do the avionics and trim work and paint the airframe.

Eastman's Frank Woodward told us the company is further uniquely positioned with regard to its labor pool. A few hundred yards down the taxiway is Georgia Aviation College, a school with a heavy emphasis on training mechanics and aerospace structural workers, many of whom are hired by Georgia's robust aerospace industry. Woodward told us Eastman taps this resource by employing part-time workers and interns.

Although sales are weak, Bryce told us the company is well positioned to ride out the downturn until the market improves. It's self financed and has little or no debt. His business model envisions a small but steady number of airframes a year. "I don't think we're ever going to see large volume in the light sport side," he told us.

switch from the pitch-and-jerk taxi turns typical of some LSAs.

Takeoff performance is typical, given that all 1320-pound low-wing airplanes with 100 HP are likely to feel the same. Pitch forces are light, but nothing like the twitchiness of the SportCruiser. Roll, on the other hand, is surprisingly heavy for a small airplane, perhaps due to control circuit issues but more likely a perception issue caused by that high stick position. It's harder to get a good purchase on it, giving the illusion of more resistance than may actually be there.

We found the rudder forces quite high. It takes a good push to move the fin. This may relate to the pivot-post rudder design or, as demo pilot Gary Webster told us, some of it may be due to the rudder/bungee interconnect for the nosewheel steering.

Stalls are what you'd expect, although because of the low seating position, the perceived deck angle seems high. The airplane will lapse into parachute mode, with some pitch bobbling and roll excursions that don't seem to ready to snap into a spin. The pre-stall burble comes on all at once, but it's noticeable and not likely to be missed by a pilot who's paying just a little attention.

One thing we think needs work is this airplane's tendency toward neutral stability. If the stick is displaced downward from a trimmed airspeed, we found that it's sluggish to return to the trimmed speed. In fact, we terminated a phugoid trial just as the airplane was headed for redline, with only a hint of nose recovery. It did the same with a pitch up. We're not able to say if this is a fault in the design or control friction, but ASTM airplanes are supposed to be strongly positively stable. Zenith's Matt Heintz told us Zenith's test revealed that the airplane is positively stable and he suspects control friction was the issue in our demonstration.

For cruise speed, the CH650 gets right along. At nearly 75 percent power—about 2590 RPM and 7.5 GPH—we saw about 124 MPH. At 65 percent power and 5.6 gallons, we recorded a more sedate and perhaps practical 110 MPH.

In the pattern, the payoff for this speed is that it takes some attention to get this thing to slow down. It hops right up to pattern altitude just off the crosswind, at which point the power needs to be yanked back smartly to keep from accelerating beyond the flap limit. Once the flaps are down, which requires a bit of retrimming, the airplane will slow nicely to a 60-knot indicated approach. With predicable pitch forces, it lands easily.

Overall, the CH650 seems like an honest, straightforward low-wing cruiser. It's neither a standout nor a laggard, but a middle-of-the-pack, credible performer. Not enough are in the field to judge them, although the well-regarded CH601 serves as a good bellwether. The fact that Zenith stepped up and addressed the wing structure issue indicates that it stands behind what it designs and builds. Furthermore, we like Bill Bryce's approach to sustaining an LSA company based on modest demand and low expenses. That smacks of more realism than the light sport segment has thus far shown.

CONTACTS

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Aftermarket Air: Portables a New Option

While little has changed in the past few years for installed air conditioning systems, new portable units may hit a sweet spot of cost and capability.

by Jeff Van West

There's not a pilot out there who hasn't pined for an AC button to push after just minutes holding short of the runway in the summer heat. But the harsh reality is that aircraft AC systems cost in all the ways we hate: weight, power draw and money. How much? Try 45-90 pounds, several horsepower and five digits before the decimal for the equipment. Now add the install time, which can top 100 hours.

Not much has changed with installed systems since we last looked at AC in 2008, except for the option of a "portable" AC unit.

ENGINE OR ELECTRIC?

Compressing AC refrigerant is either done directly off the engine or via an electrically powered compressor. The engine-driven option is usually used for small aircraft. It works passably on the ground, but doesn't really pack a punch until the engine is turning faster. The compressor must fit somewhere under the cowl, but you don't need a high-output alternator.

Electric compressors can be put anywhere (the tailcone is popular) and they can be run on the ground by GPU. After engine start, you'll need enough RPM to energize the alternator, usually at least 1300 RPM. That's usually a 100-amp alternator. Make it two for systems that cool bigger cabins. That's because the AC will draw between 40 and 100 amps all by itself, depending on the system and the size of the area it's designed to cool.

NO LONGER KEITH

The STC leader by a mile in aircraft AC is still called Keith by everyone, even though they were acquired by Meggit (Addison), Inc. The company offers over 80 STCs, as well as supplying the OEM air conditioning for companies like Cessna, Cirrus and Socata. Keith also offers conversion kits for R-12 (Freon) systems to make them work with the somewhat more environmentally friendly R-134a.

Keith's single-engine systems are all engine-driven. Size and power varies, but a Cessna 172 would use a 59-pound, 10,000 BTU system. Step up to the Bonanza and it's 14,000 BTUs and 79 pounds. They're not cheap, either. The kit for the Cessna is $16,065 for the hardware and takes 120 hours to install. The Bonanza costs $22,005 and hits 200 hours of labor.

Twins and turboprops singles get electric systems. For a Cessna 310, it's a 12,000-BTU system that weighs 80 pounds and requires 65 amps of

CHECKLIST

- You can install AC to virtually any 28-volt aircraft ...
- ... but it's not cheap, and you'll take a hit on payload and power.
- Portable AC may be a cost-effective alternative, but durability is unknown.

No matter what system you install, you'll need air inflow and outlets (as seen on this Cessna 206) cut in the fuselage. The controls for the Keith system (right) are fairly conventional. The Kelly system (left) is simply "set it and forget it," including no prohibition for uses on takeoff and landing.

juice. It'll hit you for $18,905 and take 100 hours to install. A TBM 700 is 16,500 BTUs, 90 amps and $31,556 plus over 200 hours labor.

ENVIROSYSTEMS

The other big name in aircraft cool is Envirosystems, with many OEM contracts. Their systems are available in the aftermarket through companies like Aircenter, Inc. in Chattanooga, Tennessee.

Aircenter sells its STC installations under the name Cool Air for Barons, piston-powered Twin Commanders and Cessna 310s. But they have done field approvals for dozens of others. Garry Gadberry, president of Aircenter, told us, "If it's a 28-volt aircraft, we can develop a system for that aircraft. We have the electrical and structural engineering capabilities on demand."

Cool Air is an electric system that comes in two basic flavors, a 16,500 BTU, 100-amp, 57-pound version and a 14,000-BTU, 75-amp, 40-pound one. Both require 28-volt systems, 100-amp alternators and take 100 to 125 hours to install.

Aircenter pricing for these kits is simple: $20,300 for the parts and $5500 flat for the installation if they do the work. That price is actually $1500 less than they charged when we last reported on them. "As you do more of these, you get better at them," says Gadberry. Field approvals will cost an extra $3000-$5000, depending on how much new engineering data Aircenter must generate.

KELLY

We were impressed with the potential of the Kelly Aerospace Thermo-

PORTABLE AC: A BIT LESS COOL, BUT FAR LESS COST

No, we're not talking the ice-in-a-cooler systems, here. These are real air conditioning units that use electrically driven compressors to pump out cool air.

The idea is to take all the separate parts of an AC system—compressor, condenser, evaporator, fans—and pack them in a box you can stick in the luggage compartment. ArcticAir (the same company that makes the $500 ice-based cabin cooler) and FlightLine AC have done just that.

Arctic Air has two systems. The single-fan RAC200 (RAC stands for "Real Air Conditioning") comes in 12-volt or 24-volt flavors. Cooling output depends on how much current you flow. The company claims 5000 BTUs on 19 amps for 5000 BTUs or 7000 BTUs on 27 amp. The bigger RAC400 is for cabins with six seats or more and needs 22 amps and 37 amps respectively for the same amount of cooling, but twice the volume of air flow (400 CFM in the RAC400 versus 200 CFM with the RAC200).

There are a couple of non-trival technical details. You won't get 25 amps out of your cigarette lighter, so you must install a dedicated power supply on a 50-amp breaker (there's a momentary surge of 40 amps every time the compressor kicks on). The system is controlled via a wired remote that regulates the current flow. Less current means less cooling. Systems connected to aircraft with lower-rated alternators get limited so they can't steal quite so much ship's power. Greg Turton of Arctic Air says a 100-amp alternator is ideal, but a 75-amp source will work if you'll accept less cooling.

The RACs must vent their hot air from the condenser via an installed duct running out the back of the baggage compartment to a modified inspection plate in the tail. You can improve the unit's performance by adding a duct from one of the aircraft's existing fresh air vents as dedicated fresh air for the condenser, but the unit can work just using the cabin plenum. The evaporator also needs a place to drain (just like the drips from your automotive AC). The Arctic Air unit can collect that to dump after the flight, or connect to a fuselage drain. By the way, these aren't targeted at experimentals. Almost all of the 100 systems flying are in certified aircraft.

"It's not going to get the plane to 70 when it's 105 degrees outside. That's just not going to happen," says Turton. But Turton says you can sit in a closed aircraft on a 100-degree ramp without sweating.

That's a big claim for only 5000 BTUs, so we talked to Dave Diem, Maintenance Control Manager for Transpac Aviation Academy in Phoenix, Arizona. Transpac has 17 RAC200s in their Piper Seminoles.

"The cooling factor is pretty incredible," he told us. "And they're pretty maintenance friendly, being removable." Diem says installation takes about two hours. He's quick to point out that they just installed most of them, so long-term lifespan is still an unknown. They can also be removed for the entire winter, giving you back the 42 pounds of useful load and space in the baggage compartment.

The RAC200 is 13 in x 13 in x 19, costs $4650 ($4600 for 12 volts). The bigger RAC400 is 20 in x 13 in x 19, weighs 50 pounds, and costs $4750. We hope to give the RACs a field test in the near future.

If you need even more BTUs, Flightline AC also has a portable system. It puts out 10,000 BTUs yet weighs in at a svelte 41 pounds. But it requires a 55-amp source on a 28-volt system. John Strain of Flightline AC told us it's aimed at the experimental market, but he has some customers working to put them in certified aircraft. The basic system is $6700.

cool system back in 2008. The system's DC brushless compressor draws only 33 amps (45 for max cooling). It's rated for 14,000 BTUs and weighs about 70 pounds, but 23 of those pounds are for the included 100-amp alternator that also acts as an electrical-system backup.

Thermocool is a "set it and forget it" system with a digital climate control. There's no restriction on when you can use the system, unlike many that required turning it off for takeoff and landing. Neat features include a smart sensor that will automatically power up when a GPU is connected, turn off when the GPU is disconnected, and then turn back on after engine start. All that for only $14,500 (and about 100 hours labor).

Kelly's expansion of the STC has been slow, with only the 182R added since we looked three years ago. They claim the P and Q models, as well as 172R and S models, should be approved this fall.

SOME AC INSTALLATIONS COMPARED

MANUFACTURER	AIRCRAFT	BTU	WEIGHT	DRIVE	COST*	NOTES
Keith	Cessna 172	10,000	59 lbs	Engine	$16,065	Same system used in OEM installations
Keith	Cessna 182	12,000	76 lbs	Engine	$21,279	Same system used in OEM installations
Kelly	Cessna 182	12,000	49 lbs**	Electric	$14,500	No in-flight use restrictions. Includes 100-amp alternator. Only STC'd for Cessna 182R, S, T and turbo 182T.
Keith	Cessna 310	12,000	80 lbs	Electric	$18,905	Same system used in OEM installations
Aircenter (Envirosystems)	Cessna 310	16,500	57 lbs	Electric	$20,300	Install is $5500 flat rate if done by Aircenter, plus $3000-5000 for field approval data.
Aircenter (Envirosystems)	Cheyenne III	22,000	100 lbs	Electric	$35,000	Similar class aircraft can be done for a similar cost, but install and approval is additional.
Arctic Air	Portable	5000-7000	42-50 lbs	Electric	$4650	Less aircraft modification. 12 or 24 volt. Removable. Less cooling power.
Flightline AC**	Portable	10,000	41 lbs	Electric	$6700	Less aircraft modification. Removable. No install history in certified aircraft

* Does not include installation cost, which can run over 100 hours for some systems. ** Add 23 pounds for 100-amp alternator if needed.
*** Company also offers wide range of experimental-aircraft systems at 10,000 BTUs and up, with either electric or engine drive.

FLIGHTLINE AC

Catering to the experimental crowd is Flightline AC. They have standard kits for popular models like the RV-10 and will work with builders to come up with a kit for most any installation in either an engine-driven or electrical version. The electric systems cost $1200 more, however.

The compressor for a typical, four-seat single weighs about 45 pounds for the engine-driven version, or 55 pounds for the electrical one. Their systems all demand about 55 amps, but start at 10,000 BTUs of cooling and go up from there.

Given the proliferation of high-end Light Sport aircraft, it's an easy leap to imagine AC in a top-end LSA like a Tecnam P2008. "We've had interest [from] LSAs, but they're usually not willing to do the cost." The cost is high because Flightline doesn't yet have a mounting that works with the Rotax engine. Strain is hoping he can work with an LSA manufacturer to develop one. After that, he estimates an LSA system would cost about $5000 and weigh 35-40 pounds using their lightest components.

Flightline also has a completely self-contained system that puts everything in one box for easy removal off season (see page 18).

OTHER CONSIDERATIONS

We've reviewed the $500 cooling solution—ice and evaporative coolers—and found they did a passable job of cooling the cabin. The hassle is you'll have to reload them with ice or water each flight, but, hey, for $500, what do you want?

Even if you pony up for the installed AC, there's still an ongoing cost. The energy directed to cooling comes at the expense of performance. Even the lowest-draw electrically driven systems will shave two or three horsepower from your motor. The drag penalty for the cooling vents in the belly varies. One 182 installation's operating manual shows two-percent reduction in cruise. It also shows a five-percent increase in takeoff and a 50 FPM reduction in climb, if the system is running during takeoff. Many systems also move the CG slightly aft. The bottom line is to get all the numbers as they will affect your aircraft before you put your money down.

On the plus side, you get a fan-only mode to circulate cabin air when you don't need AC. And on those sweltering days when you're number three for takeoff, you can sit in quiet, cool comfort while everyone around you is fanning their aircraft doors to try to get a bit of relief.

CONTACTS

Aircenter, Inc.
423-893-5444
www.aircenterinc.com

Arctic Air
229-271-7905
www.arcticaircooler.com

Flight Line AC
541-330-5466
www.flightlineac.com

Keith Products
972-407-1234
www.keithproducts.com

Kelly Aerospace Thermal Systems
440-951-4744
www.kellyaerospace.com

AIRCRAFT ACCESSORIES

More Tiedowns: Abe's In a Walk

Storm Force's angle-iron-and-pin design bests The Claw—but only in favorable soil. Abe's plate-and-cable design leaves everything else for dead.

by Paul Bertorelli

Just as we thought we had put portable tiedown tests snugly to bed, along come two companies who said..sorry, but you forgot us. Following our review of tiedown performance during last April's tornado at Sun 'n Fun, we're looking at two products that claim to be the best. (But only one really is.)

We bought a set of Storm Force tiedowns and a company called Abe's Aviation sent us a sample kit of its product, one of the most highly engineered products we've seen to date. Into this mix, we made up a set of steel rod anchors of the sort we saw used in the JAARs and Diamond Aircraft booths to see how they would fare.

Top photo, the shopmade pin system, Abe's tiedown and the Storm Force were all tested in the same soil, using an engine hoist, left. Measurements were done with a Dillon mechanical dynamometer.

CHECKLIST

- Although it's the most expensive, Abe's tiedown system vastly outperforms everything else.
- Storm Force tiedown generally lives up to its claims in good soil.
- Shopmade steel pin system is so-so, but not a good weak-soil choice.

STORM FORCE

On its website (www.Storm Force-tiedowns.com), Storm Force claims to be 300 percent stronger and 10 percent lighter than the competition. True? That depends on the competition and the soil where the game is played.

As shown in the photos, the Storm Force system consists of three aluminum angles through which what amount to giant aluminum nails are driven at a perpendicular angle to the pulling force. Each angle gets four pins. Ropes, a case and a hammer are provided in the $109 kit. It weighs about 9 pounds.

Like The Claw, which is the main competition, the Storm Force installs easily, even in hard soil. Using an engine hoist and our pull dynamometer, we tried several tests and, frankly, we weren't that impressed with the performance in Florida's poor soil.

The best we could manage was

AC TV

For a video demonstration of the tiedown shootout, log on to www.avweb.com and select the video index. Scroll down to the tiedown shootout video.

350 pounds, less than Storm Force seems to suggest on its site and not quite what we got out of The Claw (450 pounds) in our test two years ago. (See the June 2009 issue of *Aviation Consumer*.)

This sent us in a quest for better soil and a fairer test. We found it in a shady area with a lot of tree roots. There, the Storm Force did much better, resisting some 700 pounds and more in line with the company's claims. And unlike The Claw, we didn't see any structural failures, although the aluminum pins deformed badly.

SHOPMADE SYSTEM

Using ¾-inch steel rod, we welded up three versions of the homebrew system JAARs and Diamond were using at Sun 'n Fun. Our rods were 18 inches long, with a steel T crosspiece. If driven in just outboard of the tiedown ring angled toward the ring, these can be used singly (one per ring) or in groups of three, connected by chains for cables.

In our weak soil, the pull performance was so-so, in our view. Both single pins and three-pin multiple delivered about 350 to 400 pounds of pull resistance. We think they would do better in stronger soil and if driven more deeply. Longer pins are also an option, say, about 24 inches.

Cost of these is about $50 for materials per three pins, plus the cost of the welding, which needs to be done well to keep the T-piece from breaking off during installing. The pins weigh about 2.5 pounds each, plus the weight of the chains if they're used in a three-pin configuration.

ABE'S AVIATION

If tiedowns can be high-tech, we suppose these qualify. The anchoring concept is a 7-inch perforated stainless steel plate driven into the ground at an angle to the pulling load. As with the pins, these can be used in pairs or singly.

If they're used in pairs, the plates are driven in angled away from the aircraft and at about a 45-degree angle to load. A hammer and a wooden pounding block to protect the top of the plate are provided. Two plates are connected via a stainless cable and the tiedown line is connected through a sheave to equalize the load. Getting these things into the ground takes effort, even though the plates are sharpened at the penetrating edge. Furthermore, two additional pins need to be driven for each plate. So if you're using two plates per, you'll have to do that six times.

The payoff is absolutely stunning holding power. When our engine hoist proved unable to yank the things out of the ground, we connected them to the truck hitch and kept pulling. This eventually caused the wheels to spin, at which point the dynamometer topped out at nearly 1000 pounds. We're not sure how much higher it would go.

Two cautions: The Abe's system requires a lot of scope to achieve this performance, so it's important to chock the airplane so it won't roll out of the best load pattern for all three ties.

Second, for as hard as the plates are to install, they're even harder to extract. But they're unlikely to pull out. The Abe's basic three-kit (6.5 pounds) with one plate per ring sells for $146, while the five-plate kit (two plates per wing tie, one for the tail and 9.8 pounds) sells for $212. Contact www.abesaviation.com.

The Abe's system, above, has a couple of stainless steel plates driven into the ground at an angle to the pulling load. A cable connects the plates through a sheave to equalize the load. The Storm Force, right, pulled out at a best-case resistance of 700 pounds. But it took effort to find soil strong enough. They didn't do nearly as well in weak soil.

Flight Guide iEFB 3.0: Airport Info to the Max

The "little brown book" folks did an excellent job making their product digital. If you're a fan, it won't disappoint, but the competition is more feature-rich.

by Jeff Van West

Airguide Publication's Flight Guide has long been to airport information what Jeppesen is to approach plates: Much of the same information you could get from government or other sources, all collected in a neat package with superior layout and design.

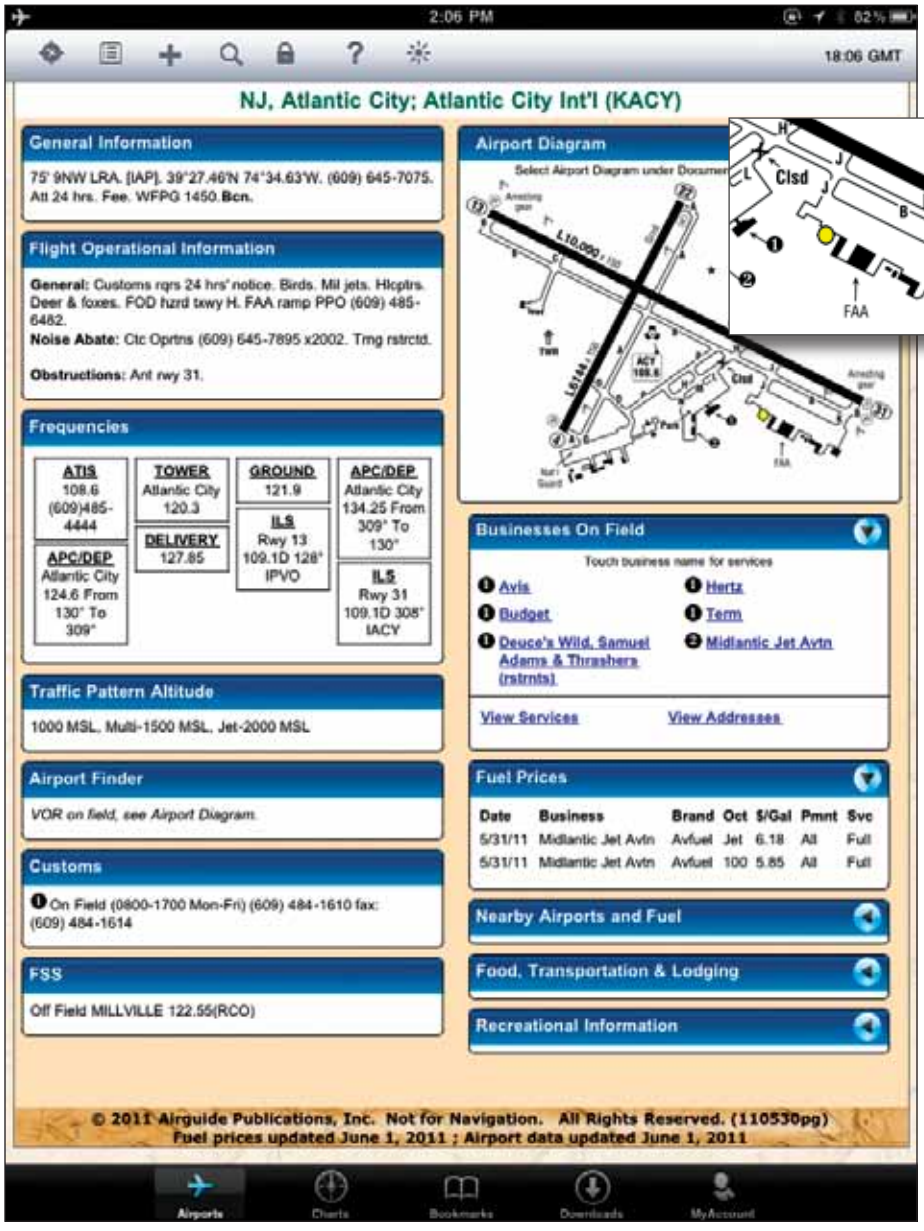
It was inevitable Flight Guide would come out for the iPad. The latest version adds the features required to be a contender in the field, such as georeferenced approach plates and a moving map. It also adds integration with Flight Guide's own GPS receiver, which paves the way for ADS-B or XM weather integration into the app.

BOUTIQUE AIRPORT DATA

Flight Guide's strongest card is their airport information and graphics. They're just easy to read. Case in point was a VFR flight down to Atlantic City, N.J. The direct VFR route bisected Restricted areas R-5002 A-E. Looking up the altitudes for all of these is usually an annoying task of digging around on the margin of the sectional chart—which, by the way, is impossible on a seamless sectional used by most iPad moving maps—to find the airspace details. But on the Flight Guide airspace graphic, it couldn't possibly be clearer. Common VFR reporting points and prominent landmarks are also handy features. Admittedly, only larger airports merit this bonus page.

The same is true of the airport diagram on the airport page. In addition to the usual data, the location of windsocks is noted, as well as numbered flags that cross reference to details for car rental, dining and the FBO. The diagram quickly expands or shrinks with a double tap, and shows your position on the field if the iPad has a GPS position fix. A plus of Flight Guide has always been offering diagrams of far more airports than the government does.

If the iPad has an internet connection, METARs, TAFs and fuel prices (at that airport and nearby) load automatically. We did wish the iEFB would grab a nearby METAR for air-



The airport information page with its custom airport diagram (left) and the airport airspace graphic for busier airports (upper right, next page) are Flight Guide's big perks. Even at small scale, the airport diagram shows your position.

ports that don't have their own, but that's a minor point. You could argue the Flight Guide data and diagrams don't leverage the color available on the iPad, as they are reprints of the paper versions. But on the plus side, this made them easily readable even in direct sunlight. The iEFB also offers a dimming feature for nighttime.

While seamless charts hide the chart margins, they are better for a general-use moving map. Flight Guide lets you switch between seamless or not on the fly. Speed, course and altitude show on any map view when connected to a GPS.

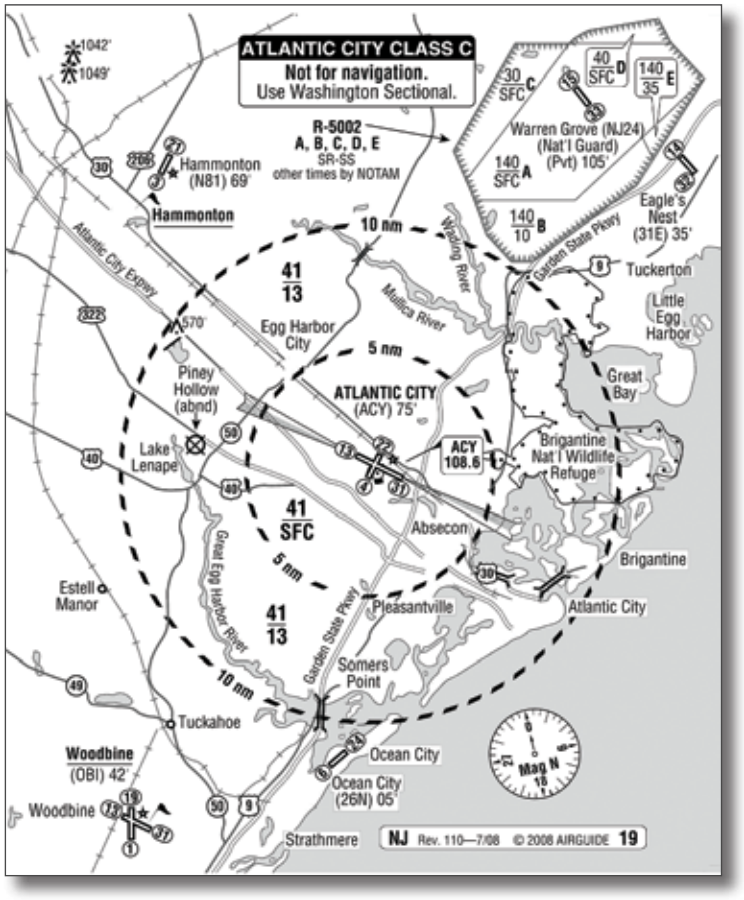
ROOM TO GROW

Flight Guide offers a full range of maps—sectionals, en route, terminal, WAC—but there's no flight planning or route. So you can see where the aircraft is, but there's no familiar pink line showing the course, nor is there any way to use the map to calculate routes, distances and times. That's not a critical miss if your goal is just using the iEFB as a digital chart, but it's something virtually every competing app offers. There's no advanced weather for flight planning or the ability to file flight plans for the app, either. Flight Guide says this is in the works.

We were surprised that NOTAM data wasn't downloaded along with weather and fuel data. This is a bigger miss, in our view. One of the great benes of having digital airport data is that you can grab all the NOTAMs before a flight and then double-check any specific one in the air. That's especially useful for instrument approach NOTAMs when you may not know which approach you need until you arrive.

Overall navigation of the app is good, although the search function is less forgiving than apps like ForeFlight or WingX. Download management is good, if not as fast as competing apps.

Flight Guide pricing could take a lesson from the simplicity of their diagrams. There are nine different plans ranging from $109/year ($9.95/mo) to a whopping $319/year ($28.95/mo). The simplest plan gives you the Flight Guide diagrams and sectionals for the CONUS, but nothing is geo-referenced and there are no instrument procedures. The most expensive one is VFR and IFR products for all 50 states (all data) and the Caribbean (charts only). In that plan, all maps, diagrams and approach plates are georeferenced (geo-ref data by Seattle Avionics). The remaining seven plans are combinations in between those extremes.

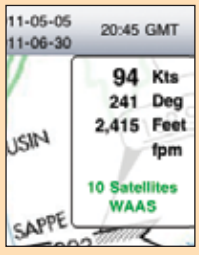


If you like Flight Guide's boutique data, the basic VFR package is a reasonable premium over something like ForeFlight's $79/year, even though ForeFlight offers extensive flight planning as well. If you're comparing georeferenced, IFR and VFR data, though, now the Delta could reach over $150 in favor of ForeFlight or WingX, not even including the extra features of those apps. How much is the custom-collected and nicely presented data worth to you?

We think Flight Guide has an app that's a contender for the right user. Subscribers also get access to the Flight Guide data online, so there's an extra perk. It will become more interesting when they integrate a few more features, such as flight planning and inflight weather. We'll keep you posted.

FLY-WI GPS: WORK IN PROGRESS

Flight Guide also offers the Fly-Wi GPS receiver. It connects to the iPad via WiFi. This allows some extra data exchange with Flight Guide's own app, such as the number of satellites in view and vertical speed. On georeferenced approach plates, it also shows you descent angle in degrees. Cute.



The unit has its own batteries or can draw from a power plug. The company claims eight hours on battery power, but our unit seemed to have trouble going more that two. It was a developmental, so this may not be typical. We also saw some WiFi drops that caused GPS position loss, but they may have been power-related.

Plans are for the device to accept XM or ADS-B data and stream that to the iPad with the GPS data. That would justify the Fly-Wi's $299 price tag. Until then, though, we think there are better options for an iPad GPS.

Twin Comanche

Economical, quick and quiet, the Twinkie stands out as one of Piper's best.

photo by Stuart Soden

Piper's Twin Comanche occupies a special status in the world of GA airplanes. When we last examined the model five years ago, we compared it to Diamond's new-age DA42 twin. Diamond may have stubbed its toe since then, but the Twinco has lost none of its luster.

Owners prize the airplane for the same reasons that they always have. It's an affordable, economical and accessible twin with decent performance. In many ways, it's one of the few twins that can claim to be not much more expensive than a single to own and operate. Or so many owners say.

Prices of Twin Comanches have softened in the last five years, but they haven't plummeted. It's possible to find one with a spiffed-up panel and new paint for around $70,000. Although many have had panel upgrades over the original 1960s instrumentation, we don't see many converted to glass.

MODEL HISTORY

The Twin Comanche first saw the light of day in 1963 and between then and 1972, Piper built about 2150 Twin Comanches in its Lock Haven, Pennsylvania, plant—the same factory that produced the venerable Cub. By any measure, the Twin Comanche was sleek and sporty compared to the airplane it followed, the dowdy, bulbous-nosed PA-23 Apache. (That airplane eventually evolved into the PA-23-250 Aztec, a strong airplane for Piper in its own right.) The Twin Comanche has two designations, PA30 and PA39.

> ***In many ways, it's one of the few twins that can claim to be not more expensive than a single to operate.***

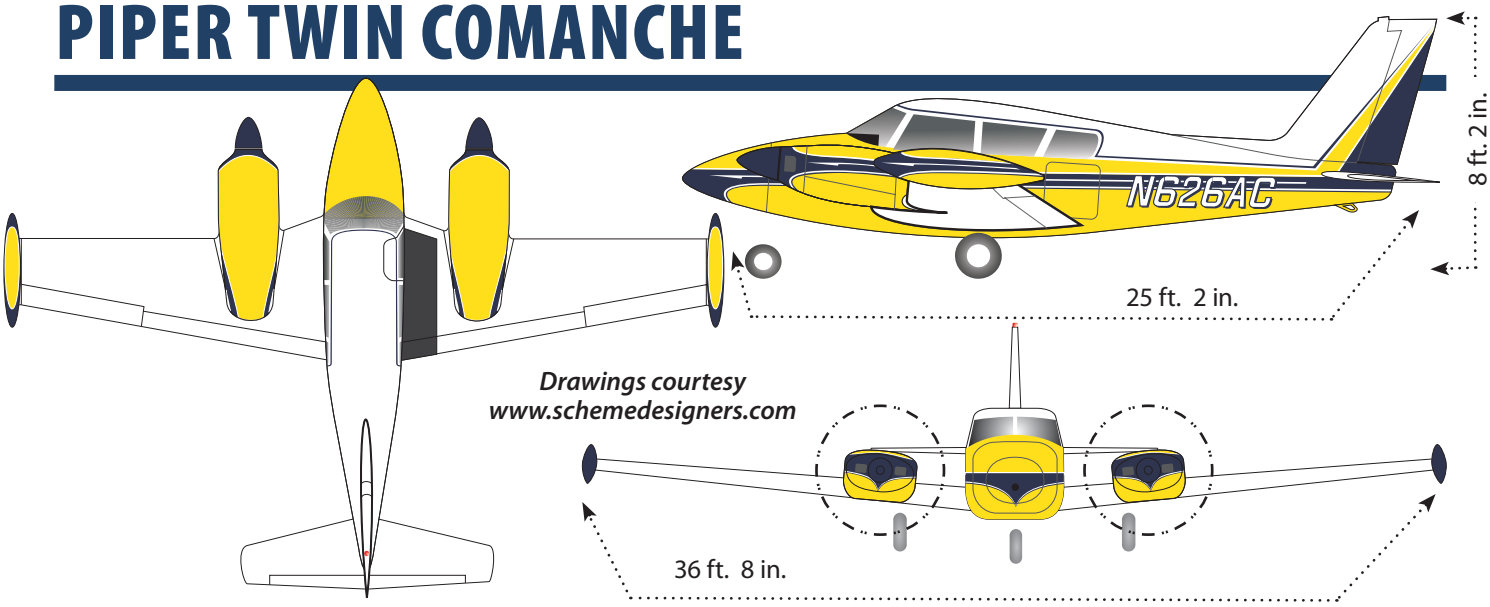
The first Twin Comanche shared two things with its slower predecessor, the Apache: It had four seats and the same basic 160-HP Lycoming O-320 powerplant. One difference is that the PA30 has the injected version of the O-320, the IO-320-B1. Cabin room was virtually identical in both airplanes.

But the Twin Comanche was clearly a different airplane. Compared to the Apache's short and squat looks, the Twinkie was rakish, with a sloped windshield, a pointed nose, tiger shark engine nacelles and even optional tip tanks. With cruise speeds as fast at 170 knots, along with miserly fuel burn, the Twin Comanche proved popular among private owners, flight schools and charter operators.

In 1966, Piper introduced a new Twin Comanche—the PA30B. Although it has two extra seats, it really isn't a six-place airplane for anything but the shortest flights and the smallest people. The extra seats eat up the baggage space and the useful load of 1390 pounds allows just a half load of fuel if all six seats are filled. Given the airplane's low fuel consumption, half fuel is enough for 300 miles or so, but it's not realistic to think of the Twin Comanche as a six-place airplane. (There are windows for the fifth and sixth seat passengers, but they're better at illuminating what's really a large baggage compartment.)

In an era when turbocharging wasn't common in light aircraft, Piper brought out the PA30B in 1966, with

PIPER TWIN COMANCHE

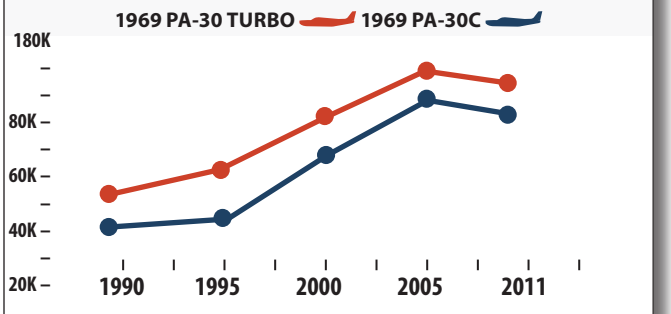


Drawings courtesy www.schemedesigners.com

SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1963-1965 PA-30	160-HP LYC IO-320-B1A	2000	$25,000	90/120	1390	169 KTS	±$54,000
1966-1968 PA-30B	160-HP LYC IO-320-B1A	2000	$25,000	90/120	1350	169 KTS	±$80,000
1966-1968 PA-30 TURBO B	160-HP LYC IO-320-C1A	2000	$25,000	120	1317	194 KTS	$85,000
1969 PA-30C	160-HP LYC IO-320-B1A	2000	$25,000	90/120	1330	172 KTS	$90,000
1969 PA-30 TURBO C	160-HP LYC IO-320-C1A	2000	$25,000	120	1290	209 KTS	$110,000
1970-1971 PA-39 C/R	160-HP LYC IO-320-B1A	2000	$25,000	90/120	1370	172 KTS	± $80,000
1970-1971 PA-39 C/R TURBO	160-HP LYC IO-320-C1A	2000	$25,000	120	1390	192 KTS	± $101,000
1972 PA-39 C/R	160-HP LYC IO-320-B1A	2000	$25,000	90/120	1370	172 KTS	$100 ,000
1972 PA-39 C/R TURBO	160-HP LYC IO-320-C1A	2000	$25,000	120	1200	192 KTS	$110,000

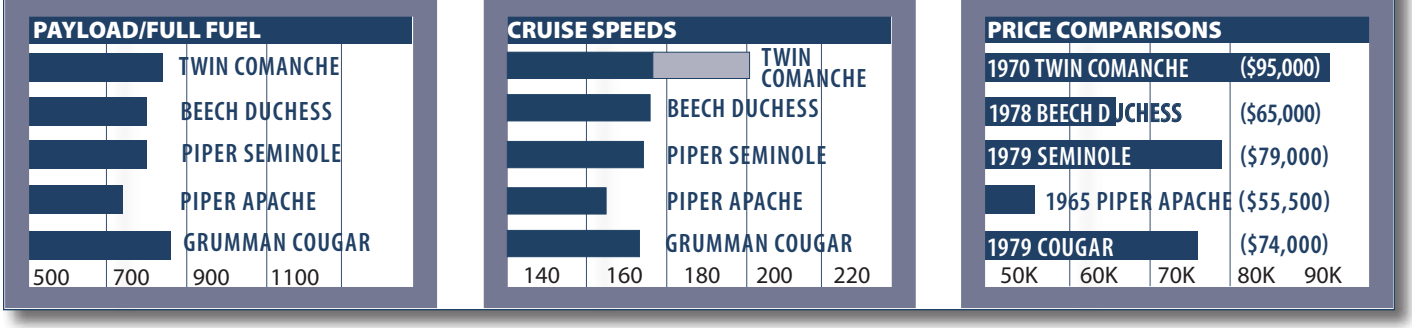
RESALE VALUES

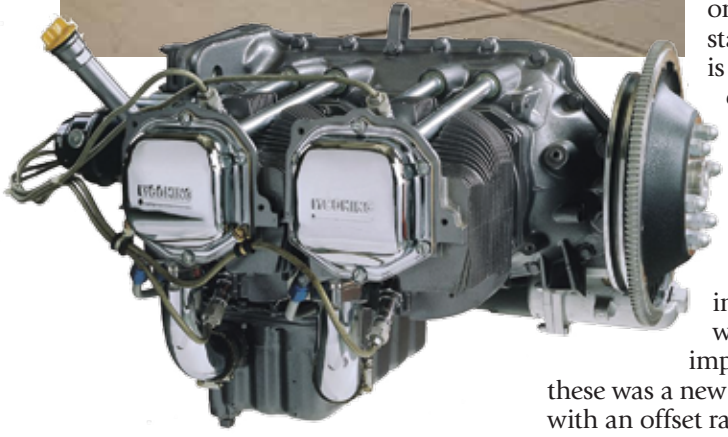


SELECT RECENT ADs

AD 97-01-01	GEAR SIDEBRACE STUDS INSPECTION
AD 94-13-10	STABILATOR TORQUE TUBE INSPECTION
AD 83-19-03	LOWER SPAR CAP CHAFING
AD 83-10-01	REPETITIVE FUEL-SYSTEM INSPECTION
AD 77-13-21	LANDING GEAR COMPONENT INSPECTION

SELECT MODEL COMPARISONS





Nelson Brandt has been flying this 1964 model, top, since 1995, primarily between Atlantic City and Cape Cod. It has the larger Arapaho windshield mod from Knots2U. Lycoming's O-320 series (carbureted version shown) has proven a reliable powerplant for the Twinkie.

optional factory installed Rayjay turbochargers, boosting potential speeds to 190 knots in the mid to high teens.

Nor were these the seamless, automatic wastegate turbos we're used to today. Each turbo had a wastegate controlled directly by a mechanical cockpit knob. Although such a system is cheap and reliable, it imposes yet another cockpit duty on the pilot. By modern standards, when FADEC is in the offing, it's quite crude. In fact,

For any pilot not used to this system, flying it can be like running a steam locomotive.

In 1969, Piper introduced the PA30C, which offered minor improvements. Among these was a new instrument panel with an offset radio rack and flight instrumentation in the classic T-pattern, rather than Piper's traditional hodgepodge arrangement, which many of the earlier airplanes still have. The last of the Twin Comanches was the PA39 series. Distinguished by its counter-rotating engines, this series was regarded by many as the finest of the Twin Comanche line and, say many owners, the one to buy. These are bargains at between $75,000 and $120,000.

Twin Comanche production ended in 1972, a victim of both a declining market and Tropical Storm Agnes, which drove the Susquehanna River over its banks, flooding the Lock Haven plant. By then, Piper was already established in Vero Beach, Florida, but neither the single nor the Twin Comanche variants made the transition to Vero.

MARKET SCAN

With more than 2000 built, there are usually plenty of Twin Comanches to pick from in various stages of repair, restoration and upgrade. We think a prospective owner should be thinking in the $70,000 to $120,000 range. According to the Aircraft Blue Book Price Digest, the PA39 CR—first year 1970—sells for about $95,000, still a bit more than a 10-years newer Seminole but about the same as a Beechcraft Duchess.

Despite being longer in the tooth than either of those models, the Twinkie still enjoys the edge in both speed and efficiency, although the Duchess may be a better handling airplane. It's certainly easier to land gracefully.

The days of aircraft appreciation are long over; the game has turned defensive. In that regard, the Twin Comanche has done better than most, depreciating less than some other twins, almost surely because of its low operating costs. As avgas prices continue to rise, this trend will likely sustain itself. Even if the twin market isn't robust, there's always some demand from owners comforted by the notion of a second engine.

PERFORMANCE

Depending on model and year, Twin Comanche owners report cruise speeds of 160 to 210 knots on 13 to 16 gallons per hour, all up. Our guess is that the median cruise is closer to the lower number than anything above 200 knots. Generally, airplanes with higher cruise speeds have various speed-boosting mods. An unmodified, normally aspirated Twin Comanche can best be thought of as a 160-knot airplane.

While it's true that this isn't faster than some modern singles, having the second engine is important to some owners. With back-up vacuum and electrical systems, tackling low IFR or night operations is less stress inducing, even if the airplane isn't exactly stellar on one engine.

Like any light piston twin, the Twin Comanche will eke out a climb with

one engine caged, but you won't suffer a nosebleed during the ascent. If everything is done just right and the weight isn't too high, look for about 200 FPM of climb, or a bit more. (Interestingly, the Diamond DA42 hasn't bettered that performance with its diesel engines, nor would we expect it to. The Lycoming-powered version, however, delivers a solid 350 FPM on one engine.)

When it was first introduced and thanks to its popularity as a multiengine trainer, the Twin Comanche suffered somewhat of a tarnished reputation with regard to handling on one engine. On a number of training flights, Vmc demonstrations got out of hand (thanks, in part, to Vmc speeds being optimistically marked 10 knots lower than today). So, Vmc and stall speed could be nearly the same. This proved to be an unnerving and fatal experience for a number of unsuspecting students and their instructors. (Many of those instructors probably were on the green side themselves.)

The stall/spin syndrome was aggravated by the FAA's then ill-advised recommendation that Vmc maneuvers be performed at as low an altitude as possible—to get full asymmetric power. This, coupled with a wing that tended to lose lift all at once in a stall, helps explain the series of training accidents. This sort of carnage wasn't unique to the Twin Comanche, by any means. The fact that the training community has wised up since the 1960s probably does more than any factor in explaining why the Twinkie has a typical accident record and isn't considered especially nasty on one engine, despite the anemic climb rate.

On the PA39—the Twin Comanche variant with counter-rotating props—stall strips that weren't standard on early models were installed on every airplane. Counter-rotating props provided an additional safety benefit by eliminating the critical engine. The FAA also issued an AD requiring that Vmc be increased to a more realistic 72 knots. Another feature on late-model Twin Comanches is interconnected aileron and rudder controls. Owners say it keeps the ball almost dead center without rudder coordination, during reasonable rates of turn and bank angles.

Overall, handling of the Twin Comanche is predictable with only one quirk: takeoffs and landings. Here, the aircraft can be a bit of a rascal. It's difficult to obtain consistent, graceful landings because if held off the runway, the airplane tends to pay off with a jolt. And on takeoff, the Twin Comanche wants to fly before Vmc.

Although the cabin is not large, the panel has room for modern avionics, top. Rear seat is a comfortable bench.

Developing techniques to deal with these peccadilloes is a frequent topic among pilots. For takeoff, owners learn to avoid pre-Vmc liftoffs by holding the airplane in ground effect until Vmc. This takes some deft handling, since it can lead to nervous skittering on the runway or porpoising. On landing, the TwinCo is a floater until, all at once, it isn't, with a thud passengers tend to notice. When the wing sheds its lift—all at once—the gear goes kerplunk! Generally, these rude arrivals are laid on the tapered, laminar-flow wing and stubby rear main gear. To make matters worse, the stabilator seems to have limited authority during the flare.

Owner tells us the Comanche's landings are safe, even if they're not pretty. The accident record isn't quite as convincing, but it's not exactly damning, either. Advice abounds on improving landings, including installing a smaller nosegear tire or raising the flaps during the flare to dump the lift and pin down the airplane.

RANGE, PAYLOAD

Because of its stingy fuel burn, the Twin Comanche has excellent range and payload tradeoffs. A few years ago, one owner wrote us gloating that with a 120-gallon capacity—thanks to tip tanks—he could fly halfway across the continent with fuel to spare. "Who could ask for more on a nickel budget?" he asked.

The first Twin Comanche, incidentally, carried 90 gallons in four wing tanks. Like the single-engine Comanche, it had four seats, with baggage space behind the rear seats.

Unlike other models, gross weights of Twin Comanches didn't evolve much. The first models had

3600-pound gross weights with empty weights of around 2300 pounds, for a useful load of 1300 pounds. With 90 gallons of gas aboard, that left 760 pounds—just enough for four people and some bags but not that much different from the load-hauling capability of many stout singles.

The PA39 CRs have gross weights of 3725 pounds but empty weights of around 2500 pounds for even less useful load than the earlier models. With 120 gallons of fuel aboard, allowable cabin load declines to 500 pounds or so. But thanks to those economical engines, that much gas translates to seven hours of endurance and exceptional range. It's both practical and possible to offload fuel in exchange for cabin load.

MAINTENANCE

AD-wise, the Twin Comanche isn't a killer. The landing gear bungee cords are supposed to be replaced every 500 hours in service, or every three years, whichever comes first. Some TC experts say this should be done annually. The bungee cord AD was promulgated in 1977 to prevent the landing gear from collapsing after a manual extension. It also helps in retracting the landing gear and, when it's too worn out to do this, the gear circuit breaker is likely to pop.

Unusual for most models, the Twin Comanche has had some one-time ADs for structural issues. While we know of few accidents caused by break-ups, owners have reported that aileron spars are especially fragile components, with cracks developing under the hinge brackets.

An AD to solved this problem required the installation of new hinge brackets. After compliance, the 100-hour inspections can be discontinued. However, reports from the field indicate that it would be prudent to continue examining this area.

The Twin Comanche's engines have an excellent service history which goes a long way toward making the airplane relatively affordable as twins go. Like the airframe itself, the engines are the target of relatively few serious ADs and many of those of the shotgun variety.

Our sweep of service difficulty reports found few smoking guns worth mentioning. Many of the complaints related to what can best be described as aging aircraft issues—old airplanes that haven't been well maintained. In turbo twins in particular, corrosion in engine mounts has caused problems in years past. Trouble spots are the areas where exhaust heat tends to weaken the metal.

On the normally aspirated models, heat fatigue problems on the engine mounts also have been reported.

Scott Ducey's Comanche, below, has the Robertson STOL kit, LoPresti Howl Cowls, speed mods and a fully upgraded panel.

Other problems to watch: Magneto coils can develop resin leaks due to overheating; heat exchangers can become burned or cracked (this was the subject of an AD requiring an expensive 500-hour overhaul); and the spinners on the Twin Comanche's Hartzell props can develop problems.

MODS, OWNER GROUP

Twin Comanche owners agree that the International Comanche Society is a worthwhile organization. Members receive a monthly magazine, Comanche Flyer, and technical help from the society. Currently, the society has more than 3000 members, with regional "tribes" throughout the U.S. For prospective Twin Comanche buyers, the society offers a book describing what to look for in a used Twin Comanche. The ICS can be reached at www.comancheflyer.com or by phone at 888-300-0082.

Although the list of modifications for the Twin Comanche isn't as long as it is for some airplanes, any airplane in service for four decades has been tinkered with. LoPresti Speed Merchants offers an improve cowl, flap gap seals, spinners and spats. Contact LoPresti at www.speedmods.com or 877-565-1731. Knots2U, another speed mod house, has a similar product line, along with windshield, lighting and nosebowl kits, to name just a few in Knots' large product line. Contact www.Knots2u.com or 262-763-5100. Hartzell has been aggressive in offering new prop conversions for all aircraft, including the Twin Comanche. Contact 800-942-7767 or www.topprop.com.

OWNER FEEDBACK

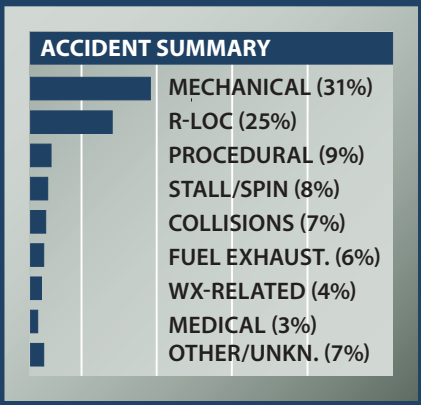
I owned and operated a Twin Comanche (PA39) back in the 1980s on Part 135 charter and currently own a normally aspirated 1969 Twin Comanche C, which I fly for business. I also do most of the maintenance on my aircraft.

The Twin Comanche is a niche aircraft that seems to appeal especially to owner/pilots who fly or have flown professionally and others who like the idea of having the redundancy offered by two small, bulletproof engines, as opposed to one large engine. The Twin Comanche is still the most economical twin to operate. Piper's engineers really hit on all cylinders with the design. It is

ACCIDENT SCAN: KEEP UP THE MAINTENANCE

It's always reassuring when our scan of the last 10 years of accidents turns up the same punch list that owners report. Keeping your Twinkie well-maintained may take some extra effort, but those that didn't paid the price, fatally 16 percent of the time. One pilot couldn't extend the gear manually —after his fourth electrical failure in two days. Get it fixed.

Runway loss of control, overwhelmingly on landing, was also a big-ticket item. Some of these were in training where the instructor probably wasn't much more proficient than the trainee. Some were in landing. (Tip: downwind landings on short grass strips probably won't end well.) To the airplane's credit, no R-LOCs were fatal and one third of the stall/spins weren't, either. Tough bird? How about the instructor and student who didn't realize they had pranged a runway light and did another stop and go before "they noticed the left wing tip was missing" and called it a day.



The "procedural" category includes several fuel starvations as well as systems misuse. The Twin Comanche is a good step-up twin but, like all twins, it requires more attention to procedures and proper technique.

one of the nicest flying twins as well as one of the most reliable and easy to maintain.

Whoever said that you can't maintain dispatch reliability in a 40-year-old airframe is just not keeping up with the squawks as they appear. Proactive maintenance and upgrades will make a Twin Comanche as reliable as a complex airplane can be. Maintenance on the Twin Comanche is straightforward, but requires some owner involvement in seeking tips and answers from other owners, unless one happens to be fortunate enough to have a genuine Comanche guru nearby.

Most mechanics do not know the Comanche, although some will try bluff their way through. Others claim to be Comanche experts based on having worked on the aircraft over the years, yet they never really seem to have learned the aircraft. Connecting with other Comanche owners through the Comanche Owners Forum on Delphi or through the International Comanche Society is a must to learn the aircraft. The landing gear system particularly befuddles mechanics, though it is a rather simple system once you understand it. Unfortunately, mechanics rarely go through the effort to carefully study the service manual or to glean useful tips from those who are fully conversant in the landing gear. Because of this, a competent pre-purchase inspection is a must, by a mechanic who truly specializes in Comanches.

I generally operate the twin between 10,000 and 12,000 feet. The wing is very happy at altitude. Fifteen GPH is a reasonable fuel burn and one can expect 160 knots true. I have cruised as high as 16,000 feet, burning 11 GPH total at 145 knots. Maintenance costs per hour are difficult to ascertain as every owner has a different philosophy about maintenance and it is also hard to separate the upgrades from the routine maintenance.

Expect 35 hours for an annual inspection. A catch-up annual can run over $10,000, but $5000 or so should be more common if maintenance is done regularly. I currently pay a little under $3000 for insurance for $105,000 hull value and $1 million smooth liability.

The Twin Comanche's reputation for being dangerous on one engine is the undeserved legacy of poor training practices and test standards fostered by the FAA. Ironically, the Twin Comanche's predecessor as the darling of the flight line, the Apache, was so forgiving that the FAA was not motivated to examine its training standards.

Kristin Winter's 1969 Twin Comanche C, above, sports modern paint and a long list of upgrades.

The Twin Comanche is no more scary on one engine than other light twins such as the Baron or the C-310. I have given training for a number of initial multi-engine ratings in the Twin Comanche and have never had any difficulty, even during Vmc demonstrations. As long as the speed is bled off slowly, nothing too exciting will happen when the loss of directional control occurs.

For those instructors who want an even greater margin of safety, placing your right fist on your right knee to block full travel of the aileron will cause the loss of directional control at five or so knots higher than normal. I have yet to have a student realize what I had done.

Like a lot of Twinkie owners, I am constantly upgrading the aircraft and overhauling systems. I realize that I will never get out of the aircraft all the money I have put into it, but that is also true of new airplanes. I will let my estate worry about resale as the Twinkie is the perfect complex four-seater, and a sexier airplane has never been produced.

Kristin Winter
Via e-mail

My 1966 Robertson STOL Turbo PA30B is my fourth aircraft. Why the PA30? For a trained and current pilot, a twin does offer additional safety. Against that stands the cost of ownership. So cost versus benefit makes most private owners decide for a high-performance single.

The only exception is the PA30 Turbo: Even at gross on a hot day, one engine keeps it flying at altitude, even above mountainous terrain. You may have to abuse the turbo a bit to do so, and go to 32 inches manifold pressure, but hey, if it is a factory turbo with the C1A engines, it does not do any harm. So what you get is big-engine Bonanza performance, good payload and pretty similar operating cost against a Bonanza.

Against that stands the lack of the excellent large cargo door the Bonanza offers. But for that you have two engines and a quieter cabin. The baggage compartment is respectable. If you want to carry more, you are in Navajo territory. A big headache, however, is finding a good maintenance shop. After some dramatic disappointments, I finally found gold at Delaware Airpark (33N), with a little outfit called Phill-Air. The owner/chief mechanic Paul is a 747 captain and does the Comanches on the side out of passion.

He holds several unique STCs for the PA30, the most important one being the nacelle tanks which give you 20 gallons each in the nacelles, right above the main gear in aluminum tanks. This is perfect, as it allows you to fly with the tanks empty if you don't need them and don't have to worry about degrading bladders. So with tips, aux, mains and Paul's nacelle tanks, you get a 160-gallon airplane, which consequently has long legs with its fuel-efficient IO-320s. And with my STOL kit, I have the same landing and takeoff performance as with my previous Cessna 182. Who can say that of a Seneca, Baron or C310? Grass strips, here I come!

Some comments on various PA30 issues:

Counter-rotating props: A detrimental modification. It costs about 10 knots and brings only redundant safety, as a Robertson STOL kit (and/or VGs for the ultimate STOL craft) removes Vmc as a factor: The airplane stalls before running out of rudder, and you have a ridiculous nose-high attitude when it finally does.

Type support: This is a task taken on by a few Comanche specialized shops, like Phill-Air, Webco and others. The type club "ICS" concentrates more on social matters for people of a certain age. With the help of these shops and some research, I have not encountered any issue sourcing critical parts. I really miss the CPA support I had with my 182.

ADs: There are some really annoying ADs out there, like the mandatory five-year hose change on the turbos, but without a type club who fights for the owner on these issues, what can you expect?

Corrosion: This is a blessing with this aircraft: Factory zinc-chromated, except if it has been abused in previous bad paint jobs. It is very likely it will be in pristine airframe shape.

Gear: Properly maintained, it is problem-free and simple. Finding a mechanic who knows the gear system well is important.

Hot starts: The LASAR ignition did the trick for me. It also saves on average about a gallon per side with no performance loss.

Landings: With the Robertson STOL kit and VGs, it lands like a 182.

In summary, there is no twin out there that comes close in performance vs. efficiency, and you get that without the cramped cockpit of a Mooney. For the price of a new 172, you get a million-dollar airplane in looks and capabilities. You will not regret the purchase and have a feasible transport even if 100LL hits $8 a gallon.

Robert Ziegler
Houston, Texas

I love the Twin Comanche. I have had the pleasure of flying a 1964 model since 1995. Operational expenses have climbed steadily since I first started flying PA30s. The attached 50-hour budget makes me want to cry. Fuel is part of it, but so is insurance. My policy with Avemco is $2600 per year for a $110,000 hull value $100,000 per person, $1 million property with a $2000 deductable. Even though I am ATP rated with 6000 hours total and 1500 hours in type, no accidents ever or claims in past five years, my premiums are higher than ever. And fuel at $5.50 a gallon is enough to make flying downright depressing.

I predominantly fly N7600Y between Atlantic City, New Jersey, and Cape Cod to visit my kids. After I owned the plane for a year, I purchased upgraded avionics to include the Bendix/King KX-155s,Bendix/King HSI, Shadin fuel computer, L3 Stormscope II and Skywatch, a VFR-only GPS and the modern-style instrument panel and control yokes. I also put in the larger Arapaho windshield by Knots2U. It's a great addition to the aircraft. PA30 purists will disagree, but I appreciate the enhanced visibility.

My single largest complaint is the fuel system. Since 1995, I replaced the Weldon C8100J fuel boost pumps at least five times due to corrosion. Additionally, corrosion in the fuel system got one of my fuel selector valves, a fuel servo, a fuel flow divider and a fuel-selector valve. I also replaced all the fuel cells after evidence of leakage was noted during annuals. When the fuel flow divider failed due to exfoliation corrosion, it resulted in the engine going to idle power. This happened at night passing 1500 feet in a VFR climb.

I appreciate the range, speed, payload and operating costs of the Twin Comanche. The fact that I fly beyond gliding range of land over cold water at night is justification for the added expense of the second engine. But compared to the much lower costs I saw published for the C-182RG in the April *Aviation Consumer*, I could be convinced to alter my flying to suit single-engine aircraft safety practices.

An amazing design, the Twin Comanche is one of the best handling airplanes I ever was privileged enough to fly. Control response is immediate and one can use pressure on the flight controls to manipulate the aircraft. It handles well in crosswinds, turbulence and is stable in IFR flight conditions.

LCDR Nelson J. Brandt
Coast Guard Air Station Atlantic City

While I love my Twin Comanche, I have to say that the single most important aspect of flying, owning and maintaining it is ensuring that you have a good mechanic who is well-versed in maintaining the airplane and can help you troubleshoot when unexpected issues arise. After purchasing my airplane and flying it home from Oregon to New York in May of 2008, I took the airplane to a local shop to fix a few issues that I had noticed during the flight.

After about a month of consistently harassing the shop, I finally got my airplane back—with a $50,000 invoice attached. How was I to know that not all shops are equipped to handle a Twin Comanche?

After realizing that I got nowhere near $50,000 worth of value out of that shop's fruitless repairs, I began undertaking research with respect to where I might be able to get reliable, cost-sensitive service for my Comanche. I heard through word-of-mouth that Paul Phillips runs Phill-Air, which specializes in Twin Comanches. Over the years, Paul and his shop have installed speed brakes and extra fuel tanks, replaced aged fuel tanks and undertaken various other repairs on my Comanche, all of which were underpriced and over-performed.

Paul's interactive approach is unrivaled. He sends pictures and updates to his customers, and his conscientious attention to detail has never once been compromised by his popularity in the industry. I think it would be very helpful if you were to mention the importance of selecting a well-qualified and informed shop with expertise in Twin Comanches and in doing so, please save other pilots the cost of fruitlessly spending on repairs, by mentioning Phill-Air (the website is www.phill-air.com).

Todd Treadway
Via e-mail

The Aviation Consumer

Letters

(continued from page 3)

ferent people. The pilots I corresponded with experienced the mayhem first hand. I received many testimonies where Flyties held strong without one failure.

The Claw clearly failed in many cases. There is an inherent weakness in the design and it will fail in actual conditions. The Claw representatives said they'll replace all of the Claw units that failed? That's a noble gesture since any failure likely meant that the aircraft involved were damaged. I'm not trying to persuade you one way or the other. I just want to bring to your attention another point of view.

Bruce Roberts
Flyties Co.
www.flyties.com

While our canvass of the grounds wasn't exhaustive, we did talk to a couple of dozen people who experienced the blow. None had Flyties, so we couldn't judge their effectiveness.

We spent time in the Hunting Solutions booth and heard nothing but testimonials from customers. It actually got a bit tiresome, frankly. In this issue, we report on two products which outperform both Flyties and The Claw, in our view.

Wise Guy

At the airline for which I flew, voice-activated commands were used for years. I never really appreciated that function until I became a Captain.

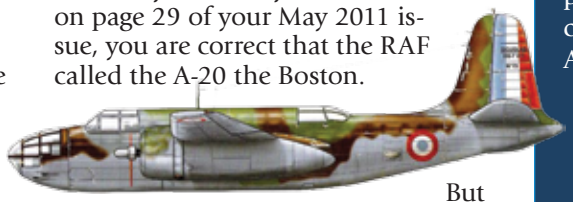
To operate the landing gear, all I had to do was say, "Landing gear up (down) please," and it magically came up (down). Same with flaps up and down. It was great.

When I got ready to eat, all I had to do was speak into an intercom and say, "Would you bring me my meal, please?" and it would appear on a tray. Technology is wonderful.

George Shanks
Waxahachie, Texas

About That Photo...

I'm sure you already know this, but on page 29 of your May 2011 issue, you are correct that the RAF called the A-20 the Boston.



But the illustration you used is of a French Armée de l'air aircraft, as you can tell by the camouflage pattern, the reversed colors in the roundel and fin flash, plus the lettering on the rudder.

Bernard Robertson.
Bloomfield Hills, Michigan

You're correct and no, we didn't know. But we do now.

ADS-B Confusion

In the May 2011 article "Portable ADS-B WX: Free Data with Limits," you write, "The slick part of this [Wi-Fi in the aircraft] is that SkyRadar also sends its GPS signal so the iPhone has a GPS even in airplane mode." This statement is confusing at best.

GPS receivers are called "receivers" because that's what they are: They receive signals broadcast by GPS satellites, do some math, and spit out location data—no transmissions are required. "Airplane mode" only disables a phone's transmitters; the receivers (and thus the GPS function) will continue to work. This is easy to test: Make sure you're someplace where your GPS-capable smartphone gets good GPS reception, put it in airplane mode, and launch a GPS location app. The app will work just fine.

James Ruhnke
Houston, Texas

The iPhone's GPS receiver is disabled in airplane mode, although wireless can be configured to function. The phone can thus receive position data through the onboard Wi-Fi system. Other phones may be different.

FEEDBACK WANTED

CESSNA 150/152

For the October 2011 issue of *Aviation Consumer*, our Used Aircraft Guide will be on the Cessna 150/152 series, the airplane everyone learned to fly in. We want to know what it's like to own these trainers, 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 150/152 by August 1, 2011, to:

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