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The Aviation Consumer®

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How Much Automation?

The unpleasant concept of a thinking computer taking over when we're the pilot in command has been wrestled in literature until it's a cliché, but technology has reached the point where we may have to face it.

It's been nearly five years since Garmin introduced the "wings level" button as part of the Perspective package on the Cirrus. It was trickle down from the military where one-push-equals-level-flight had already saved some very macho Top Gun-type fighter pilots. We don't know how many saves that button should be credited with in the GA world, because there isn't data on accidents that don't happen.

Nevertheless, for years airplanes with sophisticated autopilots have broken up in flight or augered into terrain when pilots lost control and kept trying to sort things out for themselves rather than let the autopilot fix the mess. We don't know if Perspective pilots are any more willing to surrender control to the automation should things go south in the clag than pilots before them, but we suspect that until unusual attitude recovery training includes, "use the automation," there are going to continue to be pieces of raining airplanes that include unpushed "wings level" buttons.

Because autopilots available for even the most modest GA airplanes have the capability to do everything to fly a programmed trip except operate the throttle, why do we continue to have VFR into IMC as one of the top causes of death in little airplanes? At the other end of the spectrum, runway loss of control accidents are the top cause of expensive, but usually low-injury, accidents each year. Cars have automation that will steer them out of a skid—why don't airplanes have automation that keeps them on the runway when the pilot can't seem to shove the controls in the correct direction during rollout in a gusty crosswind?

We may find out. The NTSB is putting increasing pressure on the FAA to get the persistently lousy GA accident rate down. Insurers are tired of paying to defend cases when manufacturers are sued after a pilot loses control of an airplane, unsuccessfully tries to scud run or gets a buzz job wrong.

The technology exists to create a virtual co-pilot who has the CRM talk with the pilot in command, starting out with "This isn't a good idea," progressing through, "Hey! This is stupid!" all the way to taking control. We're seeing some products that are starting down the road to doing just that.

While my opinion is that one of the big underlying reasons that flying is just plain fun is that I am in control, I wonder if the stats regarding GA pilots' ability to successfully remain in control are going to drive automation that catches pilots if they fall off the tightrope and put innocents at risk.

The idea has a certain level of discomfort, yet I would not be surprised to see it trickle into GA. Right now, insurers require most owners of high-performance airplanes to take some sort of annual recurrent training if they want insurance. Once active flight management automation is developed to a certain level at some threshold cost, it's possible that manufacturers are going to make it standard equipment and we'll have to retrofit it if we want insurance coverage.

The floor is open to discussion. And, as the products emerge, you can bet we'll be evaluating them. —*Rick Durden*

Oxygen Systems

Rick Durden's advice to use a pulse oximeter at altitude (November 2012 *Aviation Consumer*) and to start oxygen early is excellent, but oxygen saturation is only part of the picture. What really counts is your body's ability to carry oxygen and release it when needed. The carrying capacity is a product of how many red cells you have, and release is increased when you acclimatize to altitude.

Acclimatization takes weeks. I live at 8500 feet and when I get home after a month at sea level, the local four-year-old kids outrun me. If the oximeter says 95 percent but you feel out of sorts, try some oxygen.

Dr. Mark Hauswald
Via email

Our compliments to editor Rick Durden on the article about bottled oxygen alternatives. Hypoxia is an insidious problem that impacts pilots in various ways, with the worst part being decreased cognitive abilities when you need them most. Human physiology shows that no two individuals respond the same in all environments. An oximeter is a "must have" for all pilots. It's an eye-opening experience to test and compare results from different people in flight.

What was missing in Mr. Durden's analysis was the other tangible costs of owning and filling oxygen bottles. They must be inspected periodically. FBO prices range wildly. I've observed from $20 to $100 to fill the same bottle at different FBOs. A further hassle is that the FBO needs to be open, have the time and trained staff available to do a fill and possess the correct physical interface to fill the particular type of bottle.

Oxygen bottles are also a serious potential hazard in an accident—not only might they explode, but uncontrolled flow can accelerate a fire. All of these factors lead to pilots not using oxygen as often as would be prudent.

Oxygen concentrators, as described in the article, manufacture oxygen "on the fly," delivering an inexhaustible supply that does not have to be stored in tanks. As prices of concentrators continue to drop, we can expect to see them replace bottles and dominate this crucial safety function, making pilots less hesitant to use the oxygen they truly need.

Tom Laux
Inogen Aviator

Post-MX Checklist

Excellent article by Larry Anglisano on post-maintenance checklists in the November 2012 issue!

I suggest that every single post-maintenance/upgrade flight deserves equal attention. I've had some truly bad experiences.

A mechanic adjusted the aileron stops on my Mooney 25 during an annual. All seemed fine during the preflight. On breaking ground, the airplane wanted to roll hard left; it took my leg under the control wheel to keep it upright.

After an avionics upgrade, I got into the airplane and noticed the right and left seats had been swapped. The invoice showed there had been a test flight, which would have been impossible, as the seat belts would not work in that configuration.

Another time, a fuel line had not been reattached correctly, resulting in fuel flowing out and onto an exhaust pipe.

In my Aerostar, a routine radio check, pitot-static certification and replacement of a vacuum pump finished up on an evening when the weather was low overcast. I elected to wait to depart until the next day and was given a hard time about being a chicken.

The next morning was CAVU. Preflight and runup were normal. On breaking ground, I lost all air instruments, airspeed, VSI and altimeter. After flying the pattern and landing, I returned to the shop. A technician had rerouted some air lines to "make them more efficient." When I pulled the yoke full aft during the control check prior to takeoff, it had snagged and disconnected those lines.

These, and other events, happened at various facilities around the U.S. There cannot be enough said about the responsibility of the pilot to be diligent in inspecting the airplane after anyone touches it, including refueling.

Dennis Wisnosky
Via email

CORRECTION

In the FSS Remap article in the December 2012 issue, we incorrectly said that in-flight alerts for an area 50 miles on each side of the flight plan route will eventually be sent via Spider Tracks. The in-flight alerting system via Spider Tracks is already in operation. It covers a total width of 50 miles, 25 miles on either side of the flight plan route.

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FK12 Comet: Sporty, Aerobatic

Or at least it will be once it's re-engined with Lycoming's IO-233. Think of it as a mini-Pitts.

BY PAUL BERTORELLI

Not to be too cynical about it, but at a distance, one high-wing light sport aircraft looks about like another and it's no surprise they fly alike, too. In a world dominated by polished composite sameness, how to stand out? FK Lightplanes' formula is a diminutive sport biplane it calls the FK12 Comet, which no one would ever mistake for an Evektor or a Remos at any distance.

LSA FLIGHT TRIAL

In fact, if one goal of the LSA rule was to spur creativity, FK ought to be in line for some sort of award, given how unusual the FK12 is and for another of its designs, the FK14, which sports, in one version, a low wing and two side-by-side open cockpits.

FK doesn't have much of a presence in the U.S., but through its U.S. distributor, Hansen Air Group in Kennesaw, Georgia, it's working the problem with a couple of models. The standout—at least in terms of we-haven't-seen-this-before uniqueness, is the FK12, one of but a few fully aerobatic LSAs on the world market and the only biplane. Given the LSA market's tilt toward sport flying, FK (and Hansen) are figuring there will be some takers for an affordable aerobat that offers the promise of flying not limited to just the staid boring of holes in straight-and-level flight.

LIKE A PITTS

We flew the FK12 at Hansen Air Group's headquarters at Cobb County Airport northwest of Atlanta. If the airplane reminds you of a Pitts S2, that's not far from the mark. And although it's a light sport airplane, it's a mistake to think of it as less robust than a Pitts or similar aerobatic airplane. Matt Hansen told us the airframe is stressed for at least +16G and -9 G, far more than the typical gentleman's aerobatic pilot should ever hope to encounter. That loading assumes a 450-kg (990 pounds) max takeoff weight. Hansen will aim for +6 and -3Gs for the version it will sell, perhaps with a weight limit.

If that sounds appealing, there is one teensy problem: The FK12 is not formally approved for aerobatic flight because the engine manufacturer—who else but Rotax?—absolutely, positively says no aerobatics of any kind.

CHECKLIST

- (+) As the only biplane LSA, the Comet stands out in the crowd.
- (+) Easy wing folding is a plus. It will fit in a large T-hangar with another airplane.
- (~) Handling is crisp and sporty, but it's not for the neophyte pilot.

But that doesn't mean the FK12 is all dressed up with no place to go. In the works, Hansen tells us, is an aerobatic version of Lycoming's LSA engine, the O-233. It will be fuel injected and designated the AEIO-233, at 115 HP. As we go to press, two Comets are being fitted with AEIO-233s at Renegade Aircraft, whose Falcon LSA we reported on in the January 2012 issue of *Aviation Consumer*.

Hansen thinks the airplane will get traction when the O-233 is available. "We were going to bring it in just as a fun LSA," Hansen told us, "but when the Lycoming was announced, we started getting calls and we realized we might sell a bunch if it's aerobatic."

The AEIO-233 will be bolted onto an airplane that's anything but conventional. We would describe the

With about 10 minutes' work, the Comet's wings easily fold for storage or trailering, left. Baggage space is minimal, behind the turtledeck, lower photo, and up front behind the instrument panel. Tailwheel, lower photo, is non-castoring, meaning it needs to be pointed where you want the aircraft to go on touchdown.

construction of the FK12 as "a little of each." Hansen says FK—which is a hybrid German and Polish company—"has done a brilliant job of putting the right materials in the right places."

The fuselage structure is conventional welded 4130 tubing from the firewall aft. Aft of the rear instrument panel, the structure is bonded, riveted and heavily gusseted aluminum tubing. The wing main spars are carbon fiber, as are the wing leading edge D-sections. The wing ribs are a lightweight foam material, topped with a thin plywood cap strip that allows gluing the Ceconite-type wing covering painted with polyurethane. Similar construction is used in FK's high-wing FK9, but with composite wings. For weight and load considerations, the FK12's interplane struts are carbon fiber, as are the landing gear legs.

The control circuitry is similarly unconventional. Instead of ailerons, the FK12 has four flaperons, all connected to the center sticks through control rods. The ailerons are nearly fully span, so the airplane has aggressive roll rate. Although we didn't time it, Hansen says it rolls 120 degrees in a second. (We can say the control forces are quite light, as seems true of most of the LSAs we've flown.)

While many LSAs have individual brakes and a castoring nosewheel or tailwheel, the FK12 is, not surprisingly, different. A single handbrake on the rear cockpit stick controls the braking and steering is done via a hardlinked steerable tailwheel. However, for U.S. models, differential braking and a castoring tailwheel will be offered. The non-castoring wheel turns out to be a sharp knife with two edges. More on that in a moment.

If FK's build method for the FK12 is strong, it's also quite light, with an empty weight in the 650-pound range for a max weight of 1190 pounds. The Lycoming will be about 40 pounds heavier. That means a useful load, with the Rotax, of 540 pounds and 15 gallons of fuel—that's max—so there's 450 pounds of payload or a couple of 200-pounders. But with a heavy person in the rear hole, the airplane is bumping on the aft CG limit.

The FK12 has a bit of the convertible to it on two counts: The wings can be fully folded and the cockpit can be configured in any of three ways. First the cockpit: It can have a hinged large bubble covering both cockpits, a hinged bubble for just the rear with the front blocked or, the standard configuration, open cockpits with small windshields. Switching from one to the other requires minimal tools and about 10 minutes.

The same thing applies to the wings. In about 10 minutes, you can pop loose the control circuitry, drop the lower gear fairings to provide hinging clearance and release heavy wing pins to allow the wings—as pairs—to fold back and attach to the tail with a socket-end tube fixture. The airplane can then be rolled into a hangar where it requires half the storage space. Presumably, it can also be trailered or towed short distances.

Physically, the airplane is small even with the wings unfolded. The wingspan is but 21 feet, the fuselage length 19.3 feet, making for a short-coupled feeling along the yaw axis. Standard empty weight is about 630 pounds, although the version we flew weighed 654 pounds.

FLYING IT

Most pilots of average skill can get into an LSA, take it off and land it, if not prettily, then survivably. We wouldn't say the same of the FK12. It's not dangerous, mind you, but far more demanding to fly than the typical spam can. Anyone who has ever flown a Pitts will understand. First, visibility from either cockpit is limited and S-turns are a must. Even then, wings and struts tend to mask the view. Taxiing is exceptionally precise, almost to the point of nervousness. There's virtually no play in the rudder circuitry—no slop from springs because it doesn't have any. A slight pressure on the rudder pedals yields substantial directional changes. Once you're used to it, it's quite predictable, but a surprise at first. On landing, it's critical to have the tailwheel centered because once it touches down, whatever direction it's canted is the direction you're going and in a hurry.

Takeoff requires a few seconds of faith until the tail comes up and you

WHO ARE THESE GUYS?

FK Lightplanes is relatively unknown in the U.S., but has a larger presence in Europe, where the company has about 100 FK12s flying and several hundred FK9s, a highwing trainer similar to the Remos and Flight Design airplanes.

The FK14, at right, is a clever design that can have either a bubble canopy or two side-by-side open cockpits. Although you might not recognize it as such, the FK14 was the basis for the Cirrus SRS light sport that was announced in 2007, but has been on hold ever since.

Like Flight Design, FK is an amalgam of two companies, one that does design work and another that produces and markets the aircraft. The design bureau, FK-Lightplanes Germany springs from B&F Technik Vertriebs in Speyer, on the Rhine not far from the French border. FK-Lightplanes Poland, in Korczyna, does the manufacturing in a 54,000 square-foot plant.

The company is no recent entry to light aircraft manufacture, having been founded by Otto Funk in 1959 as a glider manufacturer. During the 1980s, it designed and built light powered aircraft and in 1990, B&F Technik was founded by Peter Funk. The company has been contintually involved in aircraft manufacturing since its inception. Hansen Aerogroup is the main U.S. distributor for FK Lightplanes.

can see enough to hold the runway centerline with rudder. Because the FK12 is so light, the takeoff run is short and the climb is brisk. Decisive S-turns in flight are a must to see over the nose from either seat. We saw climb rates in the 700 to 900 FPM range; again, that's LSA typical. It will likely do a little better with 15 percent more horsepower from the O-233.

The control forces are typically LSA light. In roll, the airplane begs to have the stick cranked to the stops for a rapid roll, but we didn't try that. If Mitch Hansen has, he was politic enough not to say as much. It does require rudder for coordinated turns, which is no particular surprise, except that some LSAs have limited enough adverse yaw not to require much rudder input. But with four flaperons, there's noticeable drag and adverse yaw in slow flight. There's also a bunch of control authority right up into the stall, which FK claims is about 40 MPH. The airspeed indicator in the front hole, from which we flew, had calibration errors so we couldn't confirm the stall speed. But the stall is docile, with no unpredictable pitch or roll shenanigans.

As LSAs go, the FK12 is faster than many, but slower than others. The company claims about 115 MPH at 75 percent power, which seems realistic to us. We calculated a bit better than that: 116 MPH at 6600 feet, flowing 4.6 GPH.

The FK12 is clearly intended for hang-near-the-airport sport flying, not doubling as a distance cruiser. It has 15.5 gallons of fuel aboard, all but a half gallon usable. One thing we didn't especially like is where the fuel lives—under the forward cockpit instrument panel between the front occupant's legs and the engine. The tank itself is made of heavy, translucent plastic and would likely be robust in a crash.

Nonetheless, fuel in the cabin is never a good idea, in our view, but given the folding wings, there may be no other place for it.

There's also not much space for baggage. There's a small turtledeck baggage compartment behind the pilot's head in the rear cockpit and in the front, the instrument panel folds down, revealing a tunnel-like space for additional baggage. Well, not really baggage, exactly, but the stuff *inside* the baggage, since neither of these is large enough to accommodate even a small suitcase.

None of this is surprising since the Comet is clearly intended as a sport day flyer. And that's exactly how it flies and handles. Hansen Aero, which operates a small fleet of LSAs, including the Italian-made Skyarrow, has high hopes for the FK12 once the aerobatic engine is available. But Mitch Hansen told us he has no illusions about turning low-time pilots loose in the airplane.

"This is not the airplane I'd want to try to solo a student in or turn over to someone without a lot of tailwheel time," he said. As with a Pitts, approaches and landings are done mostly in the blind because there's no visibility over the nose from either cockpit. As with a Pitts, one method is to fly the approach in a slip with right rudder, so the runway is visible out the left side of the airplane.

Other than the limited visibility, the FK12 isn't any harder to land than any other taildragger. However, if it gets away from you, we suspect it will swap ends in a heartbeat, given the short fuselage and short coupling to the rudder. Further, the aforementioned tailwheel needs to be angled in the direction you expect the airplane to go when it touches down and that should be down the runway centerline. Differential brakes will be a welcome addition to arrest a developing groundloop before it reaches the point of no return.

CONCLUSION

The FK12, in our view, rides down the center lane of what a sport airplane can be. Despite its fair to middling speed, it's not going to double as a go-places cruiser. It's a fun flyer with aerobatic aspirations.

At an LSA-typical price of $120,000 equipped with a radio, basic instruments and a transponder, it certainly meets the claim of being affordable, in our opinion.

The coming acid test will emerge when the airplane is fitted with an aerobatic engine. When it is, we'll take another look to see how it delivers. At this juncture, if you're interested in mild aerobatics in an airplane with nothing beyond sport pretentions, the Comet is worth a look. For details, contact Hansen Aero at www.hansen-aero.com or 770-427-6311.

FlyQ EFB for iPad: Intuitive, Full-Featured

Seattle Avionics Software brings the AOPA FlyQ app to a higher level. We think it has useful functionality.

by Larry Anglisano

AOPA may take the attaboy for the organization's FlyQ app, but it's really Seattle Avionics Software that's done well with the latest FlyQ EFB.

FlyQ EFB evolved from the AOPA member-freebie FlyQ flight planning resource for desktop and smartphones. We've always been fond of Seattle Avionics' approach to flight planning and their design of well-thought-out apps for the Android market. Their handiwork continues with FlyQ EFB for iPad.

ESSENTIAL TABS

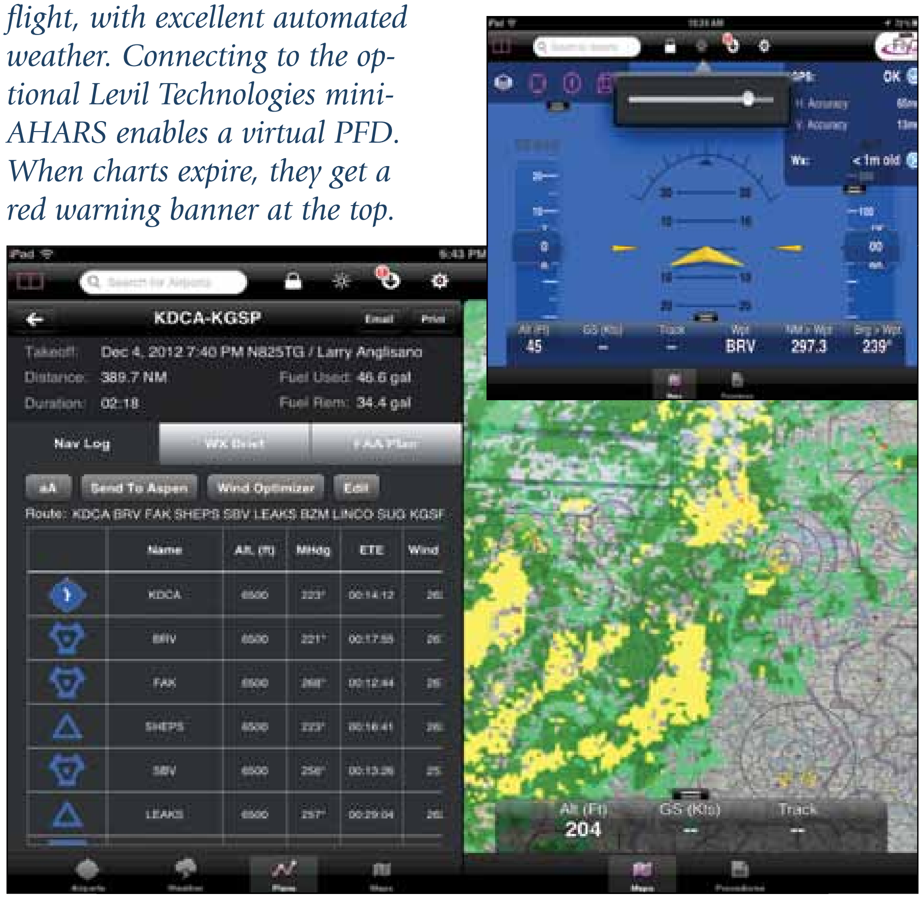
The app is intuitively built around five major menu tabs at the bottom of the screen and include airports, weather, flight plans, maps and procedures. There's also a navigation bar at the top of the screen, which includes screen brightness controls, screen orientation lock, split-screen command key, airport search and download tool. Where some other apps have us wondering where to start, we found FlyQ EFB intuitive to navigate on the first try.

We switched to split-screen mode, which shows map and airport data, a map and an approach procedure, or two maps—maybe a VFR map and IFR map, side by side. FlyQ EFB excels at mapping, with user-selected, one-touch 2D and 3D Synthetic Vision mode. An optional portable AHARS input drives the virtual PFD, which we didn't try.

Perhaps the most useful screen configuration is the display of flight plan on one screen and a variety of base maps with weather overlay on the other. But for now, weather is for preflight planning because airborne weather isn't available on the first software release. This and a traffic input will be a player in the near future, we're told.

Still, we think the FlyQ's weather capabilities are excellent, with animated radar graphics, plus METARs and TAFs logically presented in the raw or in plain language.

Flight planning with FlyQ EFB is the best we've tried since Foreflight, with excellent automated weather. Connecting to the optional Levil Technologies mini-AHARS enables a virtual PFD. When charts expire, they get a red warning banner at the top.



Speaking of flight planning the weather, The Graphical Wind Optimizer functions shows what the winds are like relative to your current track and what kind of headwind or tailwind to expect, given your current course, at different altitudes. When building flight plans, the program can flight plan based on optimized winds, or not. It's handy and intuitive at the same time, in our view.

CHOOSE YOUR PACKAGE

FlyQ is purchased in a VFR package for $69.99, with georeferenced sectionals and airport diagrams or the IFR package, for $119.99, which brings georeferenced approach procedures. These are easily accessed from the dedicated procedure tab at the bottom of the screen.

Seattle Avionics admits to a couple of program bugs in the initial release, and we experienced several crashes using the program on our first-generation iPad. You can download a 30-day free trial at www.aopa.org/flyq/tablet or on the Apple iStore.

Which Traffic Now? ADS-B a Worthy Option

ADS-B traffic is closing in on active TAS reliability at a cheaper buy-in. We think semi-portable solutions make sense for some.

by Larry Anglisano

For those shopping for a traffic system upgrade, the selection has never been more complicated. Judging by the frequent calls and letters we get from confused buyers, it's ADS-B that's creating the confusion. The buying decision might be easier once you understand the theory behind ADS-B traffic and in particular, its limitations. You'll also need to assess your flying mission and decide if the growing ADS-B system suits your mission better than active traffic alerting, known as TAS.

In this report, we'll compare these different traffic technologies and offer hints on how you might qualify a buy-in right now.

ACTIVE TAS REFRESHER

Before diving into ADS-B traffic considerations, a quick review of TAS technology is in order. TAS, for Traffic Advisory System, is the old standard for which any traffic system is judged. Unlike ADS-B, TAS can work anywhere there are other transponder-equipped targets. TAS—which evolved from big-aircraft TCAS, actively interrogates other Mode A, C and S transponder systems. The traffic alerts rely completely on those responses. Much like an ATC radar interrogation, TAS systems listen for a target reply and then calculate as much of distance, relative bearing, altitude and vertical trend as possible. Part of the traffic processing function is to calculate a closure rate to the host aircraft, called the Closest Point of Approach. If the system calculates a collision course, it issues a Traffic Alert or TA, in traffic system jargon. That's it—no ground stations, no uplink delays—it's real time alerting from a traffic target to your aircraft. A huge benefit of TAS is that it can work on the ground, so you'll see traffic in the local area before you take the runway for departure.

We think every buyer looking at ADS-B traffic upgrades should first get a proposal for a TAS system. By nature of design, these systems won't always be a good match for lesser aircraft. TAS installations are big work, with heavy and large remote processors and complex antenna work. But despite the complexity, active TAS systems have come down in price, with entry-level systems from Avidyne and Garmin priced around $10,000.

On the other hand, some installations can push that number close to $20,000. That's because the installation requires significant teardown and interfacing. They also rely on other onboard systems to step up their performance and accuracy. For instance, heading system input—either from an AHARS or HSI system—improves target-tracking performance and helps the traffic processor keep target positions in sync during major heading changes, such as a holding patterns, course reversals and maneuvering around the terminal area. This heading reference significantly lessens lag time as the system updates a threat target's position. The truth is, smaller aircraft including some LSA models just don't have these supporting systems or the useful load to accommodate a TAS. That's a gap that might be filled with an ADS-B system.

ADS-B ADVANTAGE

Active traffic systems, which operate on the 1090 MHz transponder frequency, are good at nailing the dis-

Thanks to WAAS GPS position, ADS-B traffic symbology, main photo, provides more useful data than traditional TAS traffic tags, inset.

tance to a potential traffic threat, but not so good on exact bearings. ADS-B is nearly perfect on both. Also, all active traffic systems increase the rate at which they interrogate other aircraft based on the threat—low for distant aircraft and fast for nearby ones. The 1090 MHz transponder frequencies are crowded, so a fast rate can actually have the unwanted affect of clogging the frequency and reducing accuracy. ADS-B was developed, in part, to reduce this frequency congestion. ADS-B traffic can operate on two frequencies—1090 MHz and 978 MHz. Aircraft that are transmitting ADS-B data on these frequencies will be picked up by listening FAA ADS-B ground stations. In return, the ground station builds a custom information packet with data on all traffic in the airspace around the transmitting aircraft, and transmits this traffic data to the ADS-B-out aircraft. This is called TIS-B, for broadcast traffic and includes non-ADS-B traffic targets. ADS-B also works air to air—as much as 100 nautical miles between ADS-B-equipped aircraft.

Since ADS-B outputs GPS WAAS position, speed and direction, an ADS-B on-screen traffic tag can offer more information than traditional TAS symbology. This includes a trend vector, indicating where the target will be in a certain amount of time, plus a unique aircraft ID that's programmed in the transmitter aboard the ADS-B-equipped aircraft. See the sidebar on page 10 for owner comments on flying ADS-B traffic.

BEST OF BOTH WORLDS

A solution we're following closely is the all-in-one ADS-B/TAS boxes. Garmin's GTS800-series—available now, and Avidyne's in-development TAS600B traffic processor, use both active interrogation and ADS-B receivers. These combined systems compute that the same target is on active TAS and ADS-B and uses the more accurate ADS-B data. This keeps a low transponder interrogation rate, reducing clutter on the frequency. Unfortunately, the GTS800 won't display ADS-B symbology to the user. It treats all targets as traditional traffic tags, emulating TCAS symbology. Garmin says the unit will some day differentiate between ADS-B and Mode C/A targets, but

Talk to the tower. Forget about receiving a complete ADS-B traffic picture unless your aircraft is outputting ADS-B to a listening ground station, top photo. But thanks to a growing infrastructure, coverage is improving. The Trig TT22 ADS-B transponder, second from the bottom, is a certified 1090ES output solution. FreeFlight's XPLORER receiver, bottom photo, is a semi-portable receiver priced well under $1000.

not now. One thing that the higher-power GTS820 does well is see traffic at great distances. Owners boast at tracking targets 50 and more miles away. We covered the GTS800-series in the October 2009 issue of *Aviation Consumer* and little has changed other than substantial software upgrades that improve performance in a growing ADS-B infrastructure. For bigger aircraft with more complex missions, we think TAS/ADS-B combinations are a good solution.

ADS-B IN A BOX

As we reported in the December 2012 issue of *Aviation Consumer*, Garmin's GDL88 is a remote box with mandate-compliant ADS-B out while receiving on 1090 MHzand 978 MHz frequencies. It's also compatible with non-Garmin boxes. As we go to press, the GDL88 is in the certification process. Since the GDL88 is a permanently mounted transceiver, Garmin told us it won't interface with portable displays. It will, however, be avail-

ADS-B PIREPS: SO FAR, SO GOOD

We talked with a handful of pilots who have installed ADS-B traffic systems in their go-places aircraft and reports are favorable. All have used non-ADS-B traffic in the past, so they have a solid basis for comparison.

Connecticut-based Bonanza owner Bill Foley ditched the Mode S TIS datalink traffic in his airplane in favor of a semi-portable ADS-B traffic solution because it wasn't offering the coverage he needed. "On my frequent trips to the Midwest, I was often out of range of TIS radar that could uplink traffic targets. I was traffic blind."

Foley's new traffic system consists of a Trig model TT22 Mode S Extended Squitter transponder which outputs on 1090 MHz, a Garmin GDL39 portable ADS-B receiver, which works on both 1090 MHz and the Universal Access frequency of 978 MHz.

The ADS-B receiver displays traffic on a Garmin aera 795 that Foley attaches to the control arm in the Bonanza. With this setup, he gets ADS-B traffic direct from any other aircraft with an Extended Squitter transponder and uplink traffic of other aircraft being painted by ADS-B ground station radar. He also receives free ADS-B weather. "On a recent trip from Connecticut to Iowa, via Pittsburgh and Flint, I had continuous coverage. Most of the big guys who fly above 18,000 feet have an ADS-B transponder, so I communicate directly with them, getting accurate position information."

Florida-based pilot Gerd Pfeifl, who flies a Cessna 340 and takes frequent trips up and down the east coast and to the Great Lakes, raves about the ADS-B traffic in his airplane. It's equipped with a Garmin GTX330ES ADS-B out transponder and a portable GDL39 ADS-B receiver, which plays on his iPad, using Garmin's Pilot app. "No matter if we look at traffic received directly from other ADS-B equipped aircraft or traffic beamed from the ground via TIS-B uplink, the precision and speed of updates is just incredible. You see traffic on the display and you know it is exactly where the display paints it. After a few hours using it, you get so precise in where to look out the window that the time to acquire the traffic visually goes down to a few seconds. If traffic comes close on the display, you know that it really is close." Like others, Pfeifl reports that ADS-B coverage usually starts a few hundred feet off the ground. There is no ambiguity where other traffic is at any given time.

As one ADS-B traffic user put it, "The days of active traffic are numbered. With TAS, you might gain a theoretical advantage in certain situations, but to me this does not really matter in daily flying life. The ADS-B TIS-B coverage is so good that I do not see any substantial advantage in installing it over ADS-B."

Speaking of installations, the FAA recently announced a certification policy change intended to help avionics shops and aircraft owners manage the looming installation capacity crunch ahead of the year 2020 equipage deadline. ADS-B manufacturer Free Flight Systems told us that with roughly 225,000 aircraft required to have rule-compliant ADS-B avionics, 125 installations will need to be completed in the United States each workday, beginning in 2013.

The policy change allows avionics shops to install authorized ADS-B transmitters and WAAS GPS position sensors and submit an FAA Form 337 form for Field Approval. Authorized systems must be approved under an applicable ADS-B TSO. They must also be installed in a configuration already approved in a Type Certificate or STC. Still, as our pilot reports confirm, ADS-B seems to be maturing to a point where widespread installs will be emerging.

able with built-in, ADS-B-compliant WAAS GPS.

FreeFlight Systems TSO'd RANGR ADS-B system is another one-box solution and to date, is the only ADS-B systems that can be installed through FAA Field Approval.

For certain, ADS-B software is maturing as rapidly as the hardware. For example, Garmin's Target Trend software ups the ante in traffic awareness and is available on the GTN-series touchscreen navigators as well as on the Garmin Pilot app. In an nutshell, Target Trend provides a velocity vector display that shows how ADS-B out-equipped aircraft are moving with relation to your aircraft, which in theory, allows faster threat assessment. Target Trend's advantage is that it shows a length of the directional line. The longer the direction line on the map, the faster the target is moving. This certainly adds a higher level of target information compared to the TAS traffic, since you can pinpoint faster-moving traffic, which may be a critical threat.

As much value as a one-box ADS-B solution may provide, we think putting a sharp pencil on the cost of a semi-portable solutions is in order. This installation might be easier with less teardown. But remember, because no stand-alone portable ADS-B device can meet the FAA's year 2020 ADS-B mandate—or provide a complete traffic picture—you'll still need to install ADS-B out using a 1090ES transponder.

TIS DATALINK STILL WORKS

Often confused with ADS-B, TIS stands for Traffic Information Service. This is traffic data broadcasted from FAA ground stations directly to a TIS-compatible, Mode S transponder. The concept is similar, but not identical, to ADS-B traffic. Since the traffic data is streamed from secondary surveillance radar, dropping out of datalink coverage is a major limitations of TIS, as it is with ADS-B.

The relative location and trend of movement of Mode-A, Mode-C and Mode-S equipped airplanes within a specified service volume of terminal radars is what TIS paints, so aircraft with inoperative or transponders switched to Off won't be visible to a TIS host system.

TIS data is generated approximate-

BUILDING A TRAFFIC SUITE: A SMORGASBORD OF OPTIONS

+ Active TAS systems remain our top choice for full-time traffic alerting, particularly since they work on the ground and with a variety of displays.

– Complex and costly installation can be a deal breaker for lesser aircraft.

+ Receivers that work on 1090 MHz and 978 MHz frequencies can eliminate ADS-B transponders and have integral GPS position source.

– Receivers that work on 1090 MHz and 978 MHz frequencies can eliminate ADS-B transponders and have integral GPS position source.

+ If you can live with traffic displayed on a portable GPS or tablet computer, semi-portable ADS-B solutions are your least expensive options.

– You'll still need an ADS-B output transponder to see all the traffic, but you can make the investment later.

ly every other sweep of the radar, or every 4.7 seconds, thus traffic data is about five seconds old before it reaches the host aircraft. Using predictive algorithms, the ATC ground tracking software uses track history to present near-real-time traffic data to the host aircraft's TIS transponder, which then displays the traffic on a screen using TCAS-like symbology.

From its inception, the FAA viewed Mode-S TIS as a short-term technology to eventually be supplanted by ADS-B, which is where we are right now. We expect TIS to work for the foreseeable future, although the FAA has already decommissioned TIS Mode-S capability at many radar sites and upgrading FAA terminal radars from older ASR-7 and -8 to ASR-11 technology, which doesn't support the TIS ground equipment.

While we caution against buying into Mode S TIS traffic as a long-term solution, we think owners of some existing TIS transponders are well-leveraged to handle the ADS-B output mandate. That's because models like the Garmin GTX330 and remote GTX33 can be upgraded for ADS-B output for well under $2000. The process is to send the box to Garmin for the modification.

They'll need to be connected with an appropriate ADS-B WAAS position source—something Garmin says they are working on with their existing line of navigators. We're confident this will be wrapped up long before the year 2020 mandate, although we're not sure whether it will be a hardware or software fix or both.

PUTTING IT TOGETHER

There's no way we can say which traffic technology, ADS-B or TAS, is best for every aircraft. For aircraft that fly outside of ADS-B coverage, we think TAS is the clear solution (visit the FAA's coverage page www.faa.gov/nextgen/flashMap/index.cfm for an updated ground station map and match it against your flying missions). If you fly within ADS-B coverage, we have no problem recommending an ADS-B traffic solution, as long as you can accept coverage loss at low altitude and at times when you travel out of ground station coverage.

For certain, every aircraft that flies in controlled airspace in the year 2020 needs to have ADS-B output. This opens the door for reliable ADS-B traffic and free weather capability for every cockpit.

Looking into our crystal ball, we predict that semi-portable solutions will be the rule for lesser aircraft and tighter budgets, while a combination of TAS and ADS-B will ride along in serious, go-places aircraft. Better yet, an emerging market of single-box ADS-B solutions could drop prices even further. Still, a lot can change in seven years. We'll be watching ADS-B closely and reporting on new products regularly.

DeLorme inReach: Flexible and Reliable

The inReach personal tracker by DeLorme combines some of the best features of Spot and Spidertracks. It offers all the essentials but isn't cheap.

CHECKLIST

- (+) Paired with a smartphone, messenger gets a screen and keyboard.
- (+) Backup emergency beacon plus real communication ability.
- (~) $100 annually more than Spot, but gives better tracking and coverage.

by Jeff Van West

The aviation niche for a device like the inReach personal messengers makes sense if you know its roots. Outdoor types operating far off the civilized grid have always had the vulnerability of no method for getting messages out to friends, family or rescue personnel. Trackers fixed this by combining GPS position with satellite communication; now the hiker's position is known and can be sent along with text.

Floatplane and bush pilots are in the same remote situations, so a tracker has appeal there, too. But tracking is only part of the appeal. If you pair a smartphone with a tracker, you essentially give the messenger a screen and keyboard and it becomes a backwoods communicator. This is exactly what the DeLorme inReach paired with their Earthmate app offers (iOS or Android).

Now these devices have a wider appeal for real communication as well as a backup emergency beacon for those flying to remote locations or too high and fast to use the cell phone.

THE BASICS

InReach works with or without the paired app. To start sending tracking messages using only the inReach, hold down the tracking button. Do the same to stop tracking. Tracking messages are position, altitude and speed reports sent at a user-selectable interval from two minutes to four hours. The more messages sent, the faster the batteries run down, but an airplane in flight can move pretty far in two minutes.

A message button on the inReach lets you send one of three pre-set messages as text messages or emails, along with your current position. The most common three are, "I'm checking in OK at this location," "I'm delayed at this location, but I'm OK," and "I'm at this location and need non-emergency help."

There's also a dedicated SOS button with a lock to prevent accidental use. This sends a message for emergency assistance with your location to a service that will try and contact you or a designee. If they can't get through and confirm a false alarm, SAR is notified and given your location.

InReach gets points for keeping your charging options open. The portable unit will take AA alkaline, lithium or NiMH cells. Just remember to reset the low-power warning for the kind of cell installed. There's an optional 12-24 volt charger for $79.95 that replaces the battery holder for extended use in, say, an airplane. There's also a $19 RAM mount.

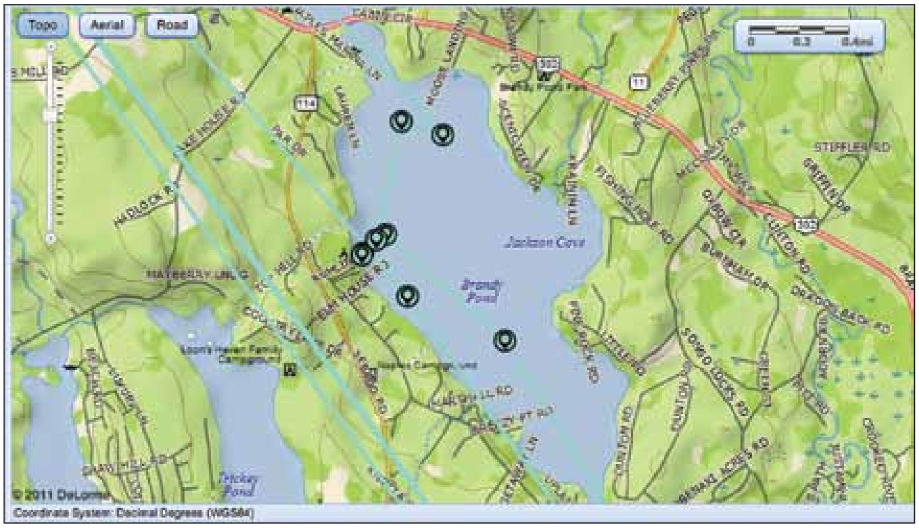
And if you drop it while beaching your seaplane, it floats. It's also waterproof to three meters.

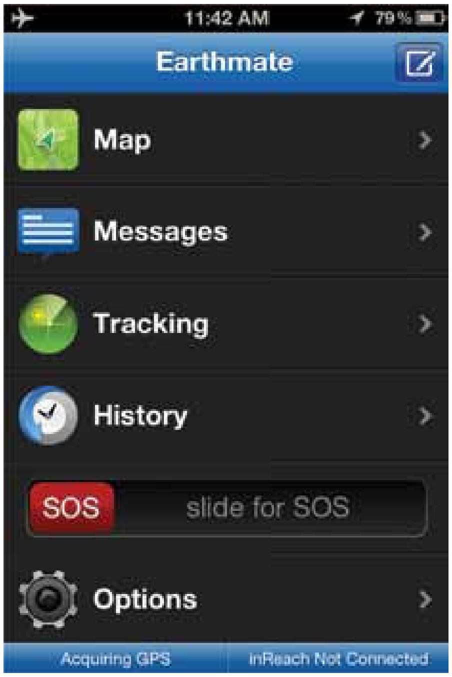
APP AND WEBSITE

Bluetooth pairs the inReach with your iPhone and the capability curve goes way up. A text messenger function within the Earthmate app lets you send any text you want to smartphones or an email address. When

Not to worry if you drop the inReach out of your seaplane, it floats.

DeLorme maps for the inReach, right, are high quality. Paired with a smartphone, the Earthmate app, lower left, can control inReach remotely and track is shown within the app, lower right.





that person replies, it comes back to your iPhone via the inReach just like a normal text message.

In our December 2010 head-to-head between two messengers on the market at the time, Spot Messenger and Spidertracks, we found the Iridium-using Spidertracks much more reliable in sending tracking messages compared to Spot's system. InReach also uses Iridium. We had zero problems getting tracking or text messages to the satellites or back. In fact, the latency for text messaging via the satellites didn't feel any different than on many cellular networks—better in some cases.

The Earthmate App can also control the inReach remotely, changing tracking intervals, sending canned or SOS messages, and reviewing the unit's tracking and GPS status. If the app is paired during tracking, the tracks are shown on maps within the app. DeLorme's first business is map making, so these are high-quality maps similar to seven-and-a-half-minute topos. DeLorme is considering offering more map options, including aviation maps. The app also offers a live map page with your current position using the messenger's highly reliable GPS.

The complete tracking and text-message history is accessible from a Website for inReach owners, as well as others granted access. So you can send a message sharing your position with anyone, including a link that shows them on a map exactly where you are as well as track your progress. It also can link directly to Facebook and Twitter. If your inReach is on and you've given them permission, they can locate you and initiate a text conversation.

MIDDLE-GROUND PRICING

The inReach hardware is $250, plus $19.95 to activate it and one of several yearly subscription plans. The $9.95/month plan is just for 10 messages and no tracking, so it's really just for the occasional user. The $24.95/month and $49.95/month plans differ only in a limit of 40 and 120 messages per month respectively. Both plans are also available in a seasonal-only package for $15/month extra if you only want tracking for a few months each year.

These prices are U.S. only. Canadian users pay a bit more and get a bit less. All North American plans include the SOS feature.

The closest competition is the Spot Connect. The Connect is only $149, plus $99/year for the basic service, plus $49/year for tracking and $49/year more for 500 messages. That's $197. The $24.95 DeLorme plan is $299.40 annually, so Spot is a full $100 cheaper. But as we said above, the tracking interval is 10 minutes and coverage isn't as robust.

DeLorme's inReach isn't for everyone, however, we think it offers a good value for those who need reliable messaging anywhere in the world. It's also an affordable option for those who need two-minute tracking, such as competition glider pilots, as it's significantly cheaper than Spidertracks and much more portable.

CONTACTS

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COCKPIT ACCESSORIES

iPad mini: Size is Right

The mini is more cockpit friendly than the iPad, but screen glare is still a pain. Wireless models lack GPS.

CHECKLIST

- (+) The mini solves the too-large-for-the-yoke problem.
- (+) At $329, entry price is right; add $130 for remote GPS and anti-glare screen.
- (~) Display quality is adequate, but did Apple miss in not improving it?

Apple's insanely popular iPad has become the cockpit digital tool of choice for the pilot masses, but not without complaint. It's a little too big and a little too heavy for convenient cockpit mounting and wouldn't it be nice if it were a tad smaller? And that's what the new iPad mini is—a smaller, more cockpit friendly version of the iPad.

But does that make it the perfect digital co-pilot? Maybe. But the answer really depends on what apps you prefer, how much you want to spend on this kind of technology and what you else you do with tablet computers. In our view, the mini is an improvement over the full-blown iPad, but there are enough what-if variables here to rule it out as a no-brainer purchase for everyone.

IT'S THE SIZE

With the exception of display resolution, the mini does what iPads and recent iterations of the iPhone do, sans phone, of course. But it does so at an overall size that's becoming increasingly popular in the tablet field, the 7- to 9-inch format. The original iPad measures 7.4 by 9.47 inches and is 0.5 inch thick. It weighs 1.5 pounds. The second-gen iPad shrunk the overall size slightly, reduced the thickness to 0.34 inches and trimmed the weight to 1.33 pounds. In other words, no real help solving the cockpit size and weight issue.

The mini, however, is 70 percent the size of the iPad. It measures 7.87 by 5.3 inches and is a mere quarter-inch thick at 0.28 inch. At 0.68 pound, it's less than half the weight of the original iPads. That means the mini will easily mount on a yoke without blocking instruments or bumping your belly. Or, it can clip into a simple kneeboard, unobtrusively, without interfering with controls. It's also light and small enough to suction cup to a side window or a clip to the glareshield, offering adequate display size without being obtrusive. So far, so good. But there are tradeoffs.

LESSER DISPLAY

Compared to the latest generation iPad with Retina and competition from the Android platform, the mini suffers on two counts. First, the overall display area is 6.4 by 4.74 inches, which is about 70 percent the size of the previous iPad versions. Obviously, if you want a smaller form factor, you're going to get a smaller screen, so there's less real estate to show plates, charts and weather data at large size. This is hardly a deal breaker.

Where the mini is less impressive, however, is display quality. The mini has a 1024 by 768 pixel display for a total of 786,432 pixels or 163 pixels per inch. It's not that this so bad, mind you, it's just that the competition is better. In the small tablet segment, Google's Android-capable Nexus 7—which is $130 cheaper—has 1.02 million pixels at 216/inch. Apple's own iPad with Retina display has 264 PPI and 2048 by 1536 overall resolution. What this means, disappointingly, is that although Apple is known for crisp, colorful displays, the mini is, if not a step backwards, a lateral sidestep.

But does it matter? For most cockpit functions, we would say no. High pixel density is most obvious in text, but the mini's text displays aren't unreadable, just slightly pixilated. We noticed no objectionable pixilation in running ForeFlight's various functions.

One other note about the display: For reasons not entirely clear, even to the tech press, Apple sticks with high-reflectance displays, meaning screen glare is a nuisance with the mini. An anti-glare screen protector is a must. The Android tablets, especially Google's Nexus 7, have lower reflectance displays that are less annoying to use in high ambient light environments.

Otherwise, the mini has the same Dual Core A5 processor used in the iPad 2 and it runs IOS 6.0.1. Price-wise, the mini is attractive when compared to other iPad models, less so when stacked against the Android offerings. A basic 16GB mini with wireless but no cellular retails for $329. Doubling the storage capability escalates the price in $100 increments to $529 for a 64GB version.

How much storage do you need? If you intend to use the mini only for an aviation app or two, some music and an e-reader, 16GB is sufficient, but for another $100, the 32GB is a reasonable step up. As for cellular capability, if you're already carrying a smartphone with the same app, why bother? The cheapest cellular-capable mini is the $459 16GB model and they go up in increments from there. But the wireless-only models don't have GPS, so you'll have to add that at $100 or so. (We like Garmin's GLO remote GPS.) Even if you buy a cellular version with GPS, we like the remote add on. It's simple to use and gives the tablet better positioning performance.

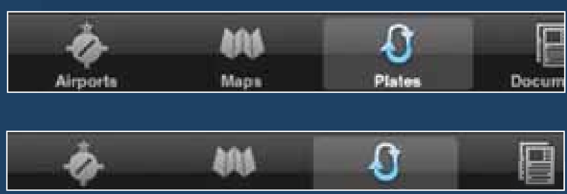
Given the pace of the product cycle, we think the risk here is less picking the wrong product than over-nvesting in the right one. You're likely to replace whatever you buy within 18 months.

COCKPIT TRIAL

In flight, there's virtually no operational difference between a full-sized iPad and the mini, except the size. And that's what this comparison is all about. As noted, we think the mini—or any iPad—needs an anti-glare screen, plus a case of some sort. That's doubly true of the mini because it's small and slick and easy to drop.

Out of the case, a simple clip kneeboard or even an office clipboard

IPAD VS MINI



For most apps, screen data can be scrolled to suit the mini's smaller display. But menu icons, left, are at fixed scale. Foreflight's icons are printed actual size here to illustrate the difference.

Hoping for a single charger for all your i-devices? Forget it. With the mini (and iPhone 5) Apple dumped the 30-pin connector in favor of its new Lightning plug, right. The Lightning contains an authentication chip, making cheap knockoffs less likely.

ADDING IT UP: HARDWARE COSTS

MODEL	PRICE	GPS INCLUDED?	SCREEN PROTECTOR[1]	TOTAL
IPAD MINI 16GB WIRELESS	$329	$100 ADD-ON[2]	$20 TO $30	$459
IPAD MINI 32GB WIRELESS	$429	$100 ADD-ON	$20 TO $30	$559
IPAD MINI 16GB CELLULAR	$459	INCLUDED	$20 TO $30	$489
IPAD MINI 32GB CELLULAR	$559	INCLUDED	$20 TO $30	$589
IPAD2 16GB[3] WIRELESS	$399	$100 ADD-ON	$20 TO $30	$629
IPAD2 16GB CELLULAR	$529	INCLUDED	$20 TO $30	$559
IPAD RETINA 32GB WIRELESS	$599	$100 ADD-ON	$20 TO $30	$729
IPAD RETINA 32GB CELLULAR	$729	INCLUDED	$20 TO $30	$759

[1] Because of Apple's use of high-reflectance displays, we think screen protectors are a must.
[2] Wireless models have Bluetooth, but no GPS. Garmin's GLO or DUAL GPS, both Bluetooth, are options.
[3] iPad 2s are not recommended. We expect them to soon be supplanted by newer products.

will do fine. We also tried the mini in a yoke and glareshield mounts from RAM and found these to be a vast improvement over the full-sized iPad, thanks to the mini's lighter weight and smaller size. The mini looks like it belongs on the yoke; the iPad just consumes too much space.

The tradeoff, if there is one, is that everything on the mini's display is simply smaller than it is on the iPad. Take an approach plate, for instance. On the iPad, a plate is still too small to read when viewed in full aspect. Pinch zooming to enlarge the area of interest, then finger scrolling around the plate addresses this.

If you do the same on the mini, you'll scale a little larger but the results are the same. You can see as much of the plate as you need to, then scroll around to find what you're after. We can't see much of a downside to the smaller size against the considerable advantage of smaller overall size.

Similarly, other features, such as weather graphics or radar, text reports or documents, can be scaled up just as easily. We didn't find ourselves squinting much, although there's no denying the display is smaller. For ForeFlight's menu icons, for example, it helps to know where they are by memory because they aren't as easy to see.

Apple claims up to a 10-hour battery life for the mini, the same as for other iPad models. But in the cockpit, you're likely to run the tablet at full brightness and an internal GPS will draw its share of battery capacity. We would guess five to six hours is more realistic.

Our mini ran for a couple of days of regular use running apps, e-reading and flight trials. One thing we don't like is that the mini requires the new Lightning plug, not the 30-pin standard used by original iPads and iPhones. If you have other i-devices, that adds the nuisance of carrying two chargers until the upgrade cycles sync again and everything has the Lightning plug.

You can buy a $30 adapter to address this, but we're disinclined to pay Apple that much for a product that ought to cost $9.95. Because of a built-in authentication chip, cheap knockoff cables may be less common than with the 30-pin connector. The mini does seem to charge rapidly, compared to the iPad.

RECOMMENDATION

Bottom line, is the mini a worthy purchase? This isn't a simple question to answer. If you haven't bought a tablet yet and are tilting toward the iPad for cockpit use, by all means consider the mini. We recommend against the iPad 2. We think the mini's smaller size is simply superior for inflight use, hands down.

If you already own an iPad and don't mind—or perhaps you like—its large size, the mini might not impress. If you have an iPad Retina, we suspect you won't like the mini's slumming display and we would advise waiting until Apple adds Retina or a higher res display to the next-generation mini.

Your preference in apps might drive the decision, too. Android apps aren't yet at parity with Apple apps, but they're getting there. If you're not wedded to Apple-only apps such as ForeFlight, the Android Nexus 7 is simply a better value than the mini. It's similar in size, albeit a little thicker, and 10 percent heavier.

At $199 for its basic version, the Nexus is not just a little cheaper, but a lot cheaper. The Nexus models also carry their own GPS receivers. We'll do an in-depth comparison of the small tablets for aviation use in a future issue, but for now, we think the mini, while a good choice, won't be the best one for all pilots looking for a cockpit tablet.

King Katmai Mod: Safe STOL

With a stall speed of 31 knots, climb rate of more than 1500 FPM and no handling vices, the King Katmai is at home in the bush or on the pavement.

CHECKLIST

- (+) Low stall speed, high performance, good useful load.
- (+) Low deck angle when flying at low speed means good visibility.
- (~) High demand means a long waiting list for the conversion.

by Rick Durden

We've long been of the opinion that lower stall speeds are a good thing when it comes to safety of flight. It's our observation that pilots are less likely to inadvertently stall airplanes that have low stall speeds, and if they do so, having less energy to absorb on impact means more chance of surviving the error.

The Peterson's Performance Plus King Katmai, is the most recent conversion from the fertile mind of Todd Peterson, expanding on his line of STOL mods of the Cessna 182. It is a descendant of the Wren 460 which was an airplane with a stunning 27-knot stall speed. The King Katmai has a stall speed 4 knots faster, but, as a tradeoff, has twice the rate of climb and a few hundred pounds more useful load. As such, it has become a darling of the back-country pilot set, with a waiting list to get one and the few that come onto the used market getting snatched up quickly.

The Wren 460 was developed in the 1960s as a sophisticated modification of the Cessna 182. A push-rod operated lifting canard—stabilizer and elevator—was installed just below the midpoint of the cowling, full-span flaps replaced the ailerons and Fowler flaps and a complex spoiler system referred to as "Wren's teeth" was created for roll control.

Loaded, the airplane could operate from as little as 300 feet of runway, impressive performance for a four-place airplane; however, the mod was expensive, on the order of four times the price of a factory-new 182. The company folded in 1972.

EVOLUTION

In the 1980s, Todd Peterson acquired what few assets there were from the bankruptcy and began building Wrens again. The labor-intensive conversion and owner complaints about lack of useful load led him to consider how things might be improved. His testing showed that retaining the factory wing of the Cessna 182 and using only the canard portion of the Wren conversion would mean the stall speed would increase, but only to 35 knots.

Further, by going to the fuel-injected version of the 182's engine, an IO-470, power could be increased to 260 HP, giving much better climb performance with virtually no weight penalty. The resultant airplane was christened the Peterson 260SE. It could take off or land in 390 feet.

Almost immediately, Peterson began offering a number of versions of the 260SE, including installation, under various STCs, of speed mods. Finding that customers desired varying combinations of mods, as well as refurbishment of airframes, the business expanded. Peterson's company offered everything from simply installing the canard on a stock Cessna 182 through locating and purchasing a good used airplane, doing the full Peterson 260SE conversion, refurbishing the interior and paint and installing a customer-selected avionics suite.

As the 260SE gained popularity with the back country and bush pilot community, Peterson sought a way to further reduce the stall speed. Installing the Wing-X STC added 18 inches to each wing and reduced the stall

300-HP engine, 31-knot stall speed and heavy-duty gear makes the King Katmai at home on rough, remote strips.

Push-rod-operated canard mounts outside the engine mount, above; brake line is routed behind main gear leg to avoid snags, above right, and gear leg has stainless steel leading edge.

speed to 31 knots. The extended wing airplane was named the Katmai, after the National Park in Alaska.

Peterson's next step was to obtain an STC for installation of a 300-HP IO-550 in the airframe. After four years of work with the FAA, the big-engine King Katmai was certified. At a price of $130,000, it has become the preferred conversion sought by Peterson customers.

The full King Katmai modification consists of the canard, 300-HP IO-550, choice of 82- or 86-inch, three-blade prop, speed mods/drag reduction fairings, wing extension, increased gross weight, heavy-duty landing gear, which includes Cleveland brakes, stainless steel leading edges on the gear legs, brake lines faired in behind the main gear legs and routed so they are unlikely to be snagged during rough field operations, heavy-duty Airglas nose strut and oversize tires.

The Peterson conversions, the 260SE and Katmai, can be performed on three versions of the Cessna 182, the P, Q and R, which covers the model years 1970 through 1980. Some 7700 182s were built in those 11 years.

Peterson explained that those years also include a cross-section of changes in the 182 line, such as from spring steel to tubular landing gear, 14- to 24-volt electrical system, uncuffed and cuffed wing leading edges and fuel bladders to wet wings, so that a buyer can have a wide variety of basic airplanes from which to choose. Peterson said that he has no trouble finding and buying very good condition airplanes to convert.

With the STC for a gross weight increase to 3100 pounds, the King Katmai we flew had a useful load of 1031 pounds. With full fuel, 77 gallons, that left an allowance of 718 pounds in the cabin.

Peterson publishes a gross weight takeoff distance of 290 feet from a hard surface runway. Our observation is that it's about right.

Takeoff procedure for all of the Peterson canard mods is to select 20 degrees of flaps, set normal takeoff trim and apply full power. A small amount of back pressure is applied after a few seconds. In a matter of moments, the airplane flies off at about 35 knots indicated. Forward pressure is immediately applied on the yoke to assume a level attitude, although the airplane continues to climb.

By the time we had reached this level attitude, the airspeed was going through 45 knots and the airplane was fully maneuverable. Should the engine fail, the low nose attitude during climb means that maintaining speed in a glide and flaring for landing is possible, something that is not necessarily the case with STOL airplanes that climb out nose-high.

The King Katmai rapidly accelerates to 60 knots indicated and requires substantial nose-down trim to maintain the increased speed. Loaded to approximately 400 pounds below gross weight, on a 60-degree day, we observed rates of climb of 1500 FPM with flaps at 20 degrees and 60 knots indicated. With flaps retracted and a climb speed of 90 knots selected, the rate of climb was 1700 FPM.

In cruise flight, with 65 percent power, burning 13.0 GPH lean of peak, true airspeed was 130 knots. While shoving 29-inch tires through the air, the King Katmai cruised at the same fuel burn and nearly the same speed as a stock Cessna 182.

CANARD

Adding any surface forward of the center of gravity is destabilizing, so we were curious to see whether the presence of the canard would result in any handling issues in pitch. Plus, as it served the reduce the stall speed by providing additional lifting surface at low speed and reducing tail-down force, thus reducing the weight borne by the wing, the positive effects seemed too good to be true.

There's no free lunch in aviation. There had to be some price, and we wanted to know the magnitude. Peterson explained that the canard is installed parallel to the thrust line and has little effect when the airspeed is above 60 knots—it has 7 degrees of downward deflection (nose up) and 1 degree of upward deflection. It is actuated via pushrods to a collar around the pilot's control column and rigged so that it is in a neutral position when the elevator is neutral.

The elevator control system of the 182, including the healthy

CONTACTS

Peterson's Performance Plus, Inc.
316-320-1080
www.katmai-260se.com

downspring in it that allows the airplane to have such a long cg range, is unchanged.

Rolling into a steep turn from cruising flight, the King Katmai behaved as does a conventional Cessna 182: After 180 degrees of turn, it had decelerated about 15 knots, requiring some back pressure on the yoke and nose-up trim. It then was willing to chug around in circles until we got bored. If there was some reduction in pitch forces due to the canard at cruise speeds, it was not immediately noticeable.

The differences became apparent in slow flight, which proved a delight. Peterson recommends 50-60 knots as a loitering/surveillance speed. With 20 degrees of flaps extended, the deck angle is nearly level and only some 15 inches of manifold pressure is required to hold altitude. The airplane trims hands off, allowing the pilot to safely look over a proposed landing area and transition immediately to a high rate of climb if needed. In this configuration, the airplane would make very tight-radius, 45-degree banked turns, requiring only a slight power increase to hold altitude, something potentially life-saving in a canyon.

FLAT DECK ANGLE

This was our introduction to a STOL airplane that flies slowly without a steep deck angle, and at a relatively low angle of attack, something Peterson touts as increasing safety. We agree—even at 40 to 45 knots, with at least 20 degrees of flap, the nose was not so high that it prevented us from seeing directly ahead of the airplane.

Full application of opposite aileron and rudder at 45 knots did not induce a stall or any handling anomalies. Stalls were as uneventful as a stock 182.

In slow flight, during stalls and when flaring for landing, it was our observation that the elevator forces were less than in an unmodified 182 where raising the nose, especially with a forward cg means pulling against the elevator downspring. With the reduced down load on the tail due to the lifting effect of the canard, and with the effect of the canard providing lift, the force necessary to flare has been lessened.

On approach, a small amount of power is carried, which allows trimming for speeds as low as 45 knots. Twenty degrees of flaps are recommended for a normal, short field, landing as the stall speed does not diminish further with additional flaps. The configuration allows for an easy go around and transition to a positive rate of climb, just requiring nose-down trim, although control forces are not unreasonable.

Below 60 knots, as with any Cessna 182, the sink rate can become impressive, thus some power is generally needed on the approach. Should a steeper approach be desired, additional flaps will allow a descent path best described as "plummet."

Coming into the flare at 45-50 knots, a small amount of power allowed a smooth flare, getting the control wheel all the way aft and a soft touchdown. Power off, the deceleration in the flare is so fast that

continued on page 32

NOSEWHEELS IN THE BUSH

Tailwheel STOL purists are undoubtedly firing up their computers to send us nasty emails about the very concept of using a nosewheel airplane in bush operations. Nevertheless, the facts have pointed in favor of nosewheel airplanes as better and safer for bush and STOL operations for some time.

Back in the early 1980s when Cessna was developing the 208 Caravan, it sent personnel throughout the U.S. and Canada to meet and fly with back-country operators to find out what was desired in a new design airplane. They were told by the operators that a tailwheel was desired, but that it was difficult to find pilots who were good tailwheel pilots because the guys they hired kept tearing up their airplanes in landing and takeoff accidents.

Cessna noted that the models 205 and 206 had long been doing just fine in the bush, so it built the 208 with a beefy nosewheel, and it's been a success throughout the remote areas of the world for nearly 30 years.

Any look at NTSB accident reports shows that tailwheel airplanes suffer disproportionately from runway loss of control accidents. While they are rarely fatal, disabling the airplane because of a groundloop or simply by misapplying the brakes, putting it up on the nose on a remote mountain airstrip is a deadly serious event.

A Katmai on big, low-pressure bush tires spreads its weight over a larger area than a tailwheel airplane, reducing the risk of bogging down on a soft surface. The pilot of a nosewheel airplane can apply maximum braking immediately on touchdown with no fear of flipping the airplane over.

In addition, save for the brief time the nose is high during the final portion of the landing flare and first part of the rollout, she can see the runway. In many tailwheel airplanes, much of the runway surface is invisible during much of the takeoff and landing roll, increasing the risk of hitting something that will disable the airplane.

The NTSB reports for takeoff and landing accidents show that tailwheel airplanes are more likely to hit an obstruction just before landing, on the runway or just after liftoff than a nosewheel airplane.

The oft-stated concern is that a rough field is likely to break off a nosewheel on landing or takeoff. Our search of accident reports did not reveal evidence to support that concern.

Having operated on terrain so rough that it broke the tailwheel off of the airplane, we cannot support a blank assertion that tailwheel airplanes are better suited for bush and back-country operations. It is an aviation myth that needs to be put to rest, as it is our opinion that a properly designed nosewheel airplane can be used for STOL, back-country operations right alongside their tailwheel brethren, and do so with less risk of having an accident in the process.

EFIS Backups: Worth the Expense?

An emerging market of standby EFIS displays tempt the budget with jet cockpit appeal. We look at three models worth considering.

by Larry Anglisano

CHECKLIST

- (+) All-in-one backups can ease partial-panel scanning.
- (+) Flexible panel mounting options, compared to round-gauge backups.
- (−) Ten grand-plus—for a backup—pushes the budget for lesser aircraft.

Every certified glass panel airplane needs backup flight instruments. Aircraft manufacturers and some glass cockpit owners are making the switch from traditional, round-gauge mechanical backups in favor of all-in-one backup EFIS systems.

The way we see it, if the primary flight data fails, you might only need backup attitude data to help you keep the wings level. Still, an all-in-one backup might be the difference between an emergency or comfortably motoring along to the destination. That's because a backup EFIS functions as a mini PFD, presenting six-pack data on one screen in a format that's nearly identical to the primary flight display. Not only does this eliminate awkward, partial panel scan, it offers additional gee-whiz appeal. But pricey proposals for installation can hinder upgrades for lesser aircraft. If these things were priced a few grand less, we think they would fly off shelves in record numbers.

REGULATION MATTERS

Everything you want to know about the installation of electronic flight instrumentation can be found in the FAA's Advisory Circular 23.1311-1C. The guidance in this AC is directed toward aircraft and avionics manufacturers, operators and modifiers of Part 23 category aircraft and covers primary and backup instruments. You'll have to dig deep into the guidance to find information on backup systems, but it's there. Section 8.5 says, in summary, that for Part 91 and 135 flights made under IFR conditions, backup attitude information is required. Section 8.7 goes on to say that for electronic displays—which is the familiar PFD found in OEM and retrofit panels—a standby, integrated display of altitude, attitude and airspeed is acceptable, in place of individual backup instruments. That's backup EFIS.

But like primary displays, backup instrumentation needs to be certified, carrying appropriate TSO for each function. This means experimental and portable EFIS displays and tablet apps won't qualify, although as we explain in the sidebar on page 22, some of these inexpensive gadgets are more than capable of saving the day when a high-priced primary system lets you down.

L-3 TRILOGY ESI

Starting at $14,995, the ESI-1000 Trilogy brings traditional L-3 reliability and durability. Since the Trilogy ESI is certified to Design Assurance Level A and is covered by a liberal AML-STC, it's suitable for the panel of a jet, turbo prop or piston single, although its high price tag has made the unit an easier sell in higher-end applications. The standalone ESI weighs less than three pounds and is built in a 3-ATI chassis, with a front bezel that measures 4.03 inches by 3.35 inches. The system uses aircraft pitot and static pressure via two ports located on the back, and has an integrated air-data computer and solid-state attitude sensor. There's a single electrical interface connector for straight-

So long, steam gauges. Required backup flight instruments are becoming all-in-one mini-EFIS displays. The compact L-3 Trilogy ESI in the subpanel of this Cirrus, left, replaces the full-size attitude, airspeed, altimeter and directional instruments.

forward wiring. The Trilogy works on 28 volts but can play in 14-volt aircraft if used with an external voltage converter.

We like the Trilogy's high-end display, which is an auto-dimming 3.7-inch diagonal, color LCD with 160 x 120-pixel resolution. Thanks to its speedy processor with a 60 Hz refresh rate, the display is completely flicker-free.

The Trilogy ESI-1000 falls short in being considered a true PFD since it doesn't display navigational data, but it can display heading information. This requires the optional MAG3100 remote magnetometer. This is a three-axis, magnetic field sensor that inputs to the display via an RS-422 databus. The sensor is installed inside the fuselage or inside a wing, while adding considerable effort to an installation.

When the magnetometer is used, a heading tape appears at the bottom of the display, which moves left and right following the direction of the aircraft, referencing magnetic north. The ESI-2000 model has a backup lithium-ion battery, bumping the base price to an impressive $15,700, not including the $5480 heading sensor.

MID CONTINENT SAM

The $10,600 MD302 SAM standby attitude module is the result of Mid Continent Instrument's experience building instruments for both OEM and aftermarket, including transport applications. The digital SAM picks up where the proven mechanical LifeSaver series electric horizon gyro left off. The MD302 has a high-end feel and seems well matched for turboprop and light jet panels, although it's aimed at the piston market, as well—evident by its ability to play in 14-volt electrical systems. At 2.3 inches high and 5.5 inches wide, the four-in-one instrument is compact enough for tight panels, with dual 2-inch displays and a single push-and-turn function knob for navigating menu screens.

Speaking of turboprops, Elliott Aviation has recently won STC approval for the installation of the SAM for backing up retrofit G1000 suites in King Airs. In these applications, the SAM replaces all of the previously used traditional backup flight instruments. The unit uses

How's this for backup? Aspen is certifying the Evolution Backup display, top photo. It's built in the familiar Evolution EFD chassis and has all of the functionality of Aspen's primary system. The Mid Continent SAM standby attitude module, middle photo, can be mounted vertically or horizontally, while the L-3 Trilogy ESIS, bottom, is the unit that started the all-in-one glass backup trend several years ago. It has optional heading.

an internal lithium-ion backup battery for powering the unit for over an hour, in case the electrics go out. The battery is constantly recharged when the unit is receiving input voltage.

The SAM uses a bright, high-resolution LCD display which is visible at wide viewing angles. It also has an installer-configurable data orientation called AnyWay, allowing for vertical or horizontal mounting in the instrument panel. The SAM is smart enough to communicate over an ARINC 429 databus—allowing interface with a compatible primary display for synchronizing baro settings, for example.

The SAM displays attitude, airspeed, altimeter and slip information, plus programmable airspeed range markings. There's also a user-adjustable lighting threshold and auto-dimming. The SAM has a 2000-hour and two-year warranty.

ASPEN BACKUP

If Aspen's Evolution Backup EFIS looks familiar that's because it's packaged in the familiar, Evolution hardware, with data and bezel controls in a horizontal configuration. Aspen offers the Backup in two flavors—the Basic model and Advanced model. The Basic version follows the lead of Aspen's entry-level Pilot PFD, providing all six-pack flight instrumentation, GPS flight plan when connected to a an external GPS, plus display of real-time winds aloft, OAT, TAS, and

UNCERTIFIED BACKUP ON THE CHEAP

The $1425 Dynon D1 Pocket Panel may not come with certification—meaning it won't qualify as a legal backup for certified OEM and retrofit glass applications—but that likely won't stop buyers from using it to back up both glass and steam gauges.

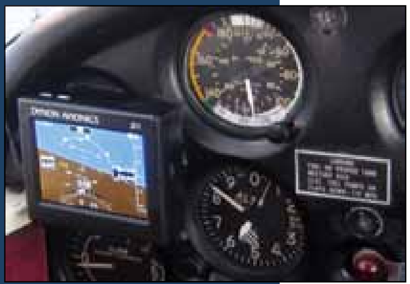
We were sold on its performance when we tested it in the September 2012 issue of *Aviation Consumer.* In fact, the D1 EFIS worked so well when we stuck it in our no-electrical system J3 Cub, we wouldn't hesitate in using it as a backup or even as a primary (without breaking any rules, that is). We also understand its limitations. To be clear, unlike the real-deal EFIS backups we tested, the D1 is far from a panel-mounted instrument and it wasn't designed as such.

Instead, the 3.5 by 3.2-inch chassis can be mounted in a portable configuration using a provided cradle and RAM suction cup mount. Wanna mount the gadget to a blank instrument cutout? Have at it, using a "pinch" mount that still retains full portability. Speaking of portability, the D1 has an internal battery that should last roughly four hours, or you can plug it in to a power receptacle.

So what's the difference between the dirt-cheap pocket EFIS and the high-priced certified backups? Plenty, and it has all to do with accuracy and design theory reliability. Unlike real EFIS systems, the D1 doesn't use pitot or static system input. Instead, it has a built-in MEMS solid-state gyro that works in conjunction with a GPS receiver. Portable GPS units have been equipped with GPS-derived flight instrumentation for years, and the D1 works on similar principle.

For example, its GPS position that calculates groundspeed—not airspeed— and GPS groundtrack, instead of magnetic heading. Altitude data is really GPS altitude and its change is calculated as vertical speed.

GPS reception works fine, even without an external GPS antenna. But for backup situations, we wouldn't care so much for GPS data. Instead, eye-widening primary instrument failure in the clouds requires a backup that helps you maintain wings-level and in our testing, Dynon's D1 should fill that role, even if it doesn't come with an FAA blessing and 10-grand-plus price tag.



Last, there's the growing market of tablet apps that provide AHARS-driven flight instrumentation, synthetic vision, ADS-B and even engine data. We'll cover these backup options in a future issue.

ground speed. The Advanced backup adds advanced navigational capability, including autopilot interface and electronic HSI for interfacing with analog and digital nav radios. It even has GPSS steering. Equipped with an internal emergency backup battery, both the Basic and Advanced Evolution Backup displays can power up for a minimum of two hours.

We think the only advantage of going with the Evolution Backup over a traditional Aspen display is the ability to mount the unit in a horizontal configuration. The Aspen Basic Backup is expected to sell for $6995 and the Advanced Backup for $10,995. This pricing is in line with the Evolution Pilot and Pro PFD systems.

INSTALL COMPLEXITY

Perhaps the most complex part of installing a backup EFIS system is the panel work. While these all-in-one units can fit the space occupied by three traditional round gauge instruments, shops still need to deal with metal and finishing work. The exception could be Aspen's Backup, which has a rear chassis design that can fit into existing instrument holes, like its big brother primary Evolution display. However, the Basic Aspen Backup, like the L-3 Trilogy, uses a remote heading sensor, which can snowball a project, especially for composite aircraft. Aspen's Advanced Backup unit is essentially the same as installing an Evolution Pro PFD—requiring a remote heading sensor and in many cases, an analog converter unit for nav and autopilot interface. The Mid Continent SAM and basic Trilogy, on the other hand, are mainly standalone, needing power, ground and pitot and static source inputs. For interfacing with databuses, the Mid Continent SAM will require more intense wiring. Our advice is to install these systems while the panel is opened for other work, especially when retrofitting primary glass.

MORE THAN EYE CANDY

While a total glass panel has modern appeal, we talked with a handful of glass cockpit owners and all had at least some concern about losing their primary flight instruments, and having to fly the inconveniently positioned steam gauge backups. "I learned to fly behind a primary flight display and to be honest, shifting my scan to the lower panel to fly the three ancient-looking backup gauges would be ugly," said one Cirrus Perspective owner. Another owner, who flies a G1000 Baron, believes the $20,000 Trilogy install in his million-dollar twin was worth every penny, since he uses it for cross-checking the primary instruments. Since the PFD in his previous G1000 Cessna failed him in the clouds, he's counting on his glass backup in the event of another primary failure.

CONTACTS

Aspen Avionics
www.aspenavionics.com
888-992-7736

L-3 Avionics Systems
www.L-3com.com
800-253-9525

Mid Continent Instrument
www.mcico.com
800-821-1212

HANGAR GADGETS

Tire Pressure: Remote Sensing

The Tire Pressure Monitor System provides a hands-free way to check all-important tire pressure on preflight. It's rugged and easy to install.

by Rick Durden

Tire pressure matters. Whether it's making takeoff roll performance numbers, hauling it to a stop after landing or just getting maximum life out of a set of tires, proper inflation plays a big role.

For owners who want an easy way to check tire pressure before getting in the airplane, Southern Precision Components' Tire Pressure Monitor System (TPMS) may be it. Small pressure sensors attached to each tire's valve stem measure and transmit tire pressure and temperature to a monitoring unit that receives the data when it is within 25-50 feet.

The monitor can be programmed to read pressure in units of PSI, KPA, bar or kg/cm squared and temperature in Fahrenheit or Celsius.

Installation proved to be easy. The kit contained everything needed, even a hex wrench for the nuts on the anti-rotation collars. AAA batteries are placed in the monitor and flat batteries in the sensors—expected life is two years.

Each valve stem cover is removed, then the anti-rotation collar—optional, it snugs up against the sensor to keep it from vibrating off—is slid on, and the sensor (each is coded for the appropriate gear leg) is screwed on tightly enough so that the tire pressure reads on the monitor. Once installed, a visual check is made to assure that there is sufficient clearance for the tire to rotate without the sensor hitting anything.

ROBUST SENSORS

The sensors proved to be robust. They are designed to be "impervious to dust, dirt, salt mist, acids and alkalis." The manufacturer recommends that each sensor be cleaned with water and a cleaner such as Simple Green at each annual inspection. To add air to a tire, its sensor needs to be removed. That means having the hex wrench handy if the anti-rotation collars are installed.

The system goes into sleep mode when the tires have not been rotating for 10 minutes. To activate the system during preflight, the airplane needs to be moved about a foot.

We made a number of takeoffs and landings with the sensors installed—afterward there was no indication that the sensors had started to vibrate loose, anti-rotation collar or not, even though we purposely allowed the airplane to stay on the ground to well above normal liftoff speed on a couple of takeoffs. We did not record the Richter-scale number of our landings.

We were interested to note that our testing clearly revealed that tires that "looked right" were generally inflated 10-20 PSI below the level called for in the POH or Owner's Manual. Because all takeoff and landing performance is based on inflation to POH standards, that got our attention.

For anyone who operates in an environment where tire performance matters, the TPMS, in our opinion, provides a simple way to quickly know when tire pressure isn't where it should be.

The TPMS can be purchased directly from Southern Precision Components, where the price quoted to us was $339.95, or through Aircraft Spruce and Specialty, where it lists for $344.00.

Tire pressure shows clearly on the monitor, below. Sensors are small with satisfactory clearance on our test airplane nose gear, inset right, and main gear, inset below right.

CONTACTS

Southern Precision Components
706-376-7308

Aircraft Spruce
877-477-7823
www.aircraftspruce.com

Piper Arrow

A sensible, well-behaved, moderate performer that never goes out of style.

It seems there's always an Arrow on the ramp as well as a good selection of them on the used market. Flight schools have long sworn by them as relatively economical complex trainers, and owners report happy relationships with their combination of useful load and range. Through longevity and numbers, it may have replaced the Bonanza as the ubiquitous retractable single.

Since it's little more than a retractable Cherokee, the Arrow is a logical step-up airplane for pilots accustomed to Piper's fixed-gear four-seaters. Moving from one cockpit to the other, everything will be familiar, from gauge placement to systems to handling and procedures. That's no accident, of course: Offering a full line of airplanes was the basic marketing model for all of the major manufacturers in the 1960s and 1970s. As they started out in two-seat trainers, pilots were encouraged to step up into similar four-place, fixed-gear models, then to retractables from the same blood line.

While the market has changed, the Arrow soldiers on. It's a relatively ubiquitous airplane, available in many flavors ranging from the original, relatively sedate 180-HP version with its short, stubby wings to a fire-breathing, T-tailed, turbocharged version perhaps best known for heat-management and runway-hogging issues: Even Piper has a bad day. A few quirks aside, though, some version or vintage of the Piper Arrow may be the right airplane at the right time for a prospective owner.

HISTORY OF THE LINE

The original PA-28 owes its existence to three pioneering designers, John Thorpe, Karl Bergey and Fred Weick, who were charged with developing an airplane that would compete with the Cessna 172. Introduced in 1962 as the Cherokee 150 and 160, the PA-28 gave Piper a badly needed shot in the arm in the low-end market. Cessna had a runaway success on its hands with the 172, and Piper's competition—the Tri-Pacer—was downright dowdy by comparison.

The original Cherokee did well, and was soon joined by the 180 and 235, giving Piper a strong lineup of fixed-gear singles meeting many missions. Since all Cherokees share the same basic airframe, the company was also able to realize some manufacturing economies.

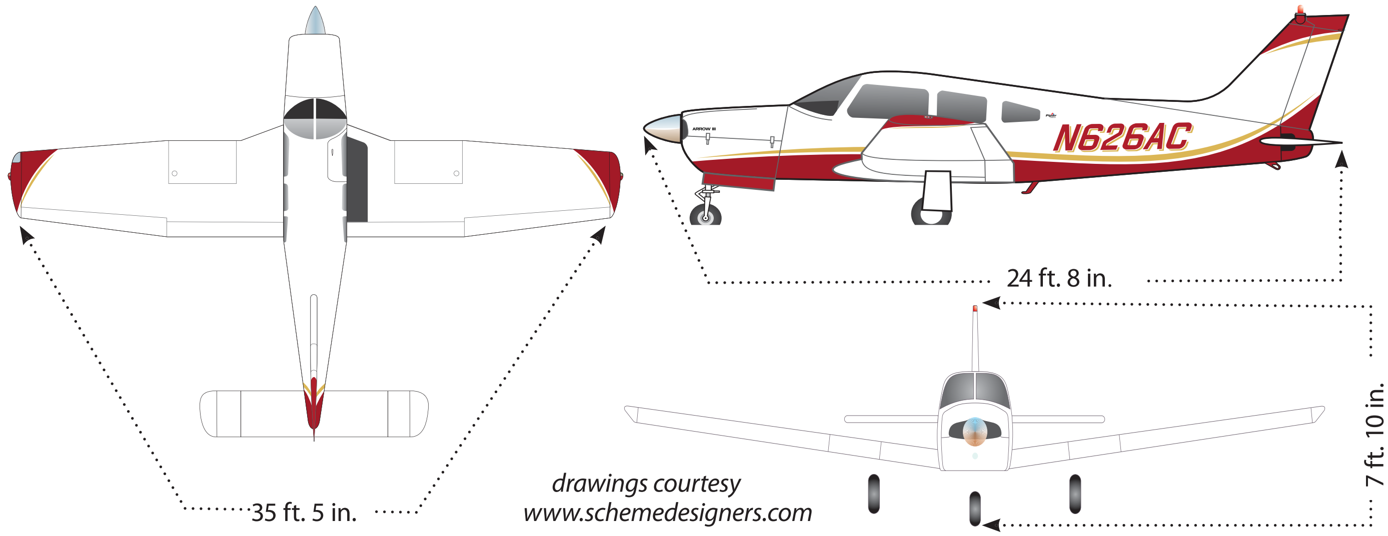
By the mid-1960s, Piper began considering the PA-28 as a candidate to compete in the light four-place retractable market, then dominated by Mooney with Beech's least expensive retractable—the Debonair—costing a third again as much as a Mooney. Cessna had no comparable airplane at all, and Piper's Comanche would go out of production in the mid-1970s.

Piper folded the gear on its Cherokee 180 and in 1967 unveiled the first Arrow. It was every bit a Cherokee, from the fat, constant-chord Hershey Bar wing to the stabilator. The base price was $16,900, some $1350 less than the Mooney M20C Mark 21 (according to the Aircraft Bluebook Price Digest). However, the average equipped price of an Arrow, as delivered, was actually about $2000 more than the Mooney. A Cherokee 180 from the same year had a base price of a mere $12,900.

The PA-28R-180 came with a constant-speed prop turned by a Lycoming IO-360-B1E engine. The new retractable gear was electro mechanical (compared to Mooney's

Through longevity and numbers, the Arrow may have become the ubiquitous retractable single.

PIPER ARROW SERIES

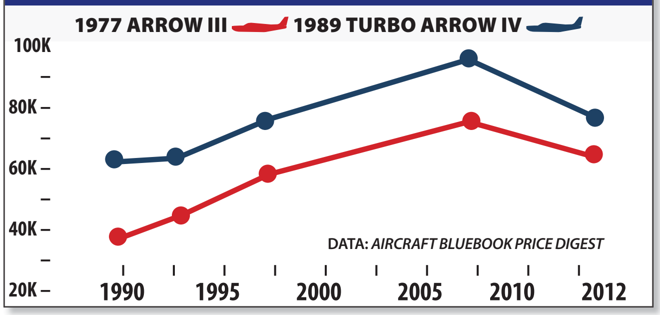


drawings courtesy www.schemedesigners.com

PIPER ARROW SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1968 PIPER ARROW (180 HP)	LYCOMING I0-360-B1E	2000	$20,000	50	1120 LBS	141 KTS	±$40,000
1969 PIPER ARROW (200 HP)	LYCOMING I0-360-C1C	2000	$22,000	50	1141 LBS	144 KTS	±$42,000
1972 PIPER ARROW II	LYCOMING I0-360-C1C	2000	$22,000	50	1127 LBS	143 KTS	±$49,000
1977 PIPER ARROW III	LYCOMING I0-360-C1C6	2000	$22,000	72	1113 LBS	138 KTS	±$61,000
1977 PIPER TURBOARROW III	TCM TSIO-360-F OR FB	1800	$32,000	72	1208 LBS	172 KTS	±$63,000
1980 PIPER ARROW IV	LYCOMING IO-360-C1C6	2000	$22,000	72	1113 LBS	138 KTS	± $69,000
1980 PIPER TURBO ARROW IV	TCM TSIO-360-FB	1800	$32,000	72	1208 LBS	172 KTS	± $74,000
1989 PIPER TURBO ARROW	TCM TSIO-360-FB	1800	$32,000	72	1208 LBS	172 KTS	±$108,000
2002 PIPER ARROW	LYCOMING IO-360-C1C6	2000	$22,000	72	1113 LBS	138 KTS	±$147,000

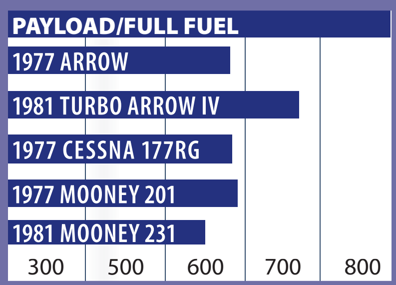
RESALE VALUES

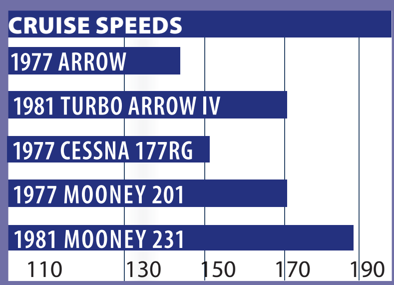


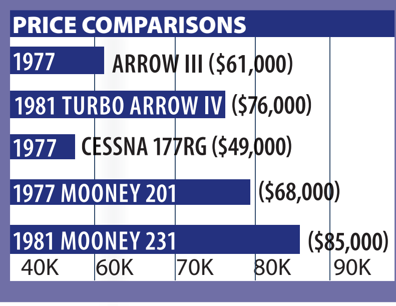
SELECT RECENT ADs

AD 2010-15-10	CONTROL WHEEL SHAFT INSPECTION FOR EXCESSIVE WEAR
AD 2006-20-09	REPLACE CERTAIN CRANKSHAFTS IN LYCOMING -360 ENGINES
AD 2006-18-15	REPETITIVE HARTZELL PROPELLER HUB EDDY CURRENT INSPECTIONS
AD 97-26-17	REPLACE NON-VAR CRANKSHAFTS IN TURBO ARROW ENGINES
AD 97-01-01	REPETITIVELY INSPECT MAIN GEAR SIDEBRACE STUDS FOR CRACKS

SELECT MODEL COMPARISONS







Stock panels have room for avionics upgrades, left, although power controls are not well placed. Interior is roomy and comfortable, lower left.

distinctive manual "Johnson bar" arrangement), and had a unique feature designed to enhance safety: an auto-extension mechanism that would lower the gear if the airplane slowed below a certain airspeed. More on the Arrow's gear system in a moment.

The original Arrow compared well with the Mooney in some departments, such as roominess and cost, but fell short in terms of speed. Cruise was pegged at 141 knots, compared to 158 for the Mooney. Still, the Arrow was considerably faster than the carbureted, fixed-gear, fixed-prop (but otherwise identical) Cherokee 180.

After two years and sales of almost 1100 airplanes, Piper came out with a 200-HP version of the Arrow. An extra $500 bought pilots a Lycoming IO-360-C1C engine, a few knots and a 100-pound boost in gross weight, though that was eaten into by a 79-pound increase in empty weight. The -C1C engine was more costly in other ways, too—it had a 1200-hour TBO, compared to 2000 for the 180. That short TBO has since been lengthened by fitting new exhaust valves, and it's highly unlikely that any of the 1200-hour mills remain. The 200's TBO is now also 2000 hours.

The 200-HP Arrow was sufficiently more popular than the 180 that the latter was dropped in 1971. Starting with the 1972 model year, the airplane was redesignated the Arrow II. Its fuselage was stretched five inches, providing more rear-seat room; its wingspan increased 26 inches by widening the Hershey Bar design and the stabilator's span increased. This allowed 50 pounds more gross weight, and the addition of the long-awaited manual gear-extension override. Thanks to larger bearing dowels, the old 1200-hour TBO was boosted to 1400 hours. The next year marked the development of a redesigned camshaft and another TBO increase—to 1600 hours.

In the mid-1970s, Piper revamped its line of metal singles (leaving the Super Cub alone), starting with the bottom of the PA-28 line. Beginning in 1975, the airplane that had been the Cherokee 140 became the Warrior, sporting a new, semi-tapered wing of higher aspect ratio than the familiar Hershey Bar and a 150-HP engine. This new wing found its way onto the Arrow in 1977, creating the Arrow III. In that same year, Piper made a turbocharged version of the Arrow. More on this variant in a moment.

The new wing improved performance somewhat, most notably in terms of glide. It also gave pilots a healthy 24-gallon increase in fuel capacity.

The Arrow III lasted only two model years. In 1979, Piper made a controversial design decision, opting to follow the T-tail design fad. The was dubbed "Arrow IV." Predictably, performance suffered. Like many T-tail airplanes, the Arrow IV flies differently than Arrows with conventional tail feathers. The T-tail, depending on airspeed, is either very effective or far less effective than a conventional tail (which isn't as prone to abrupt transitions between different flying regimes). This occurs because the stabilator sits up out of the propwash, and so is less effective at low airspeeds. Many pilots complain that the Arrow IV has squirrelly low-speed performance, with a tendency to over-rotate on takeoff. Others, who don't try to fly the Arrow IV like the earlier models, look more favorably upon the T-tail. Regardless, some who have flown both report the T-tailed version also demands more attention to pitch trim when changing airspeeds.

During the general aviation slump of the late 1980s and early 1990s, Arrow production was spotty: The normally aspirated Arrow IV wasn't built for model years 1983 through 1987; only the Turbo Arrow IV was available. For model years 1988, 1989 and 1990, conventional tail, normally aspirated Arrows were made alongside T-tailed turbo models. The last three Turbo Arrow IVs were 1990 models; subsequent Arrows through current production all have conventional tails and lack turbos. No Arrows of any flavor carry 1991 or 1993 model designations; this was the time when Piper was on the rocks, searching for a buyer. One Arrow is labeled as a 1994 model.

Piper emerged from bankruptcy in 1995 as New Piper, a moniker dropped in 2006. Today's version—known simply as the "Arrow," without any Roman numerals—is essentially an Arrow III, arguably the best of the bunch. The 2012 model's base price is $414,900, which includes a Garmin G500 avionics suite, but no autopilot.

MARKETPLACE

When the Arrow was introduced, its only real competition came from

Handling is smooth and predictable, with no unpleasant quirks.

Mooney's early M20s. Other manufacturers soon realized the viability of the market segment, however, and it wasn't long before other competitors appeared. Beech's offering was the rather lackluster (though roomy) Sierra, while Cessna weighed in first with the Cardinal RG, then the Cutlass RG. Rockwell got into the small retractable business with the Commander 112, and Mooney upped the ante with the landmark 201.

The average equipped prices of these airplanes when new in 1977 (the first year all of them were offered at once) ran as follows: Arrow III: $50,320; Cessna Cardinal RG: $50,095; Rockwell Commander 112: $61,295; Beech Sierra: $53,594 and Mooney 201: $57,420.

The marketplace has declared the Arrow the runaway winner in terms of non-adjusted appreciation: That same 1977 airplane has increased in value by 21 percent. The Mooney is second, up a little over 18 percent. The big loser is the Sierra, which has lost considerable value. It's worth noting the used marketplace doesn't like the T-tailed Arrow much, either: A 1979 PA-28RT-201 has not yet recovered its new average equipped price, while a 1978 Arrow III is worth about 10 percent more than its new cost.

The Mooney runs away from the rest in speed and efficiency, which have great value. This is food for thought, since the Arrow is no faster than, say, a Grumman/AGAC Tiger, an airplane that delivers this performance on 20 less horsepower with a fixed-pitch prop and fixed landing gear. It costs about 15 to 20 percent less to buy, and less to maintain.

PERFORMANCE/HANDLING

The 200-HP Arrow is an unremarkable performer; the 180-HP version is, well, doggy. Cruise speeds range from 130 (180-HP) to 143 knots (normally aspirated 200-HP T-tail) and as high as 170 knots for a turbocharged version flown in the teens. The non-turbo'd Arrows consume nine to 12 gallons per hour, with the "blown" versions using around 14 GPH when pushed. A Cessna Cardinal RG, Cutlass RG or Grumman Tiger will go as fast, while burning less fuel. And a Mooney 201, on the same fuel, goes the fastest. Still, the Arrow has a roomier interior than all but the Cardinal, and its useful load is the greatest: 1200 pounds.

The first two Arrows had somewhat limited range, thanks to their 48-gallon fuel capacity. Beginning with the taper-wing Arrow III, 72-gallon fuel tanks eliminated that problem. Taper-wing Arrow owners report as much as 6.5 hours' endurance, while Arrow II owners sometimes wish for larger tanks.

The Arrow handles much like any PA-28, which is to say it's fairly benign. Stalls are a non-event. The wing loading is lower than higher-performance retractables like the Bonanza/Debonair and Mooney, which means a less solid ride in turbulence and lower speeds. However, that's also a benefit during landing. Owners report few vices.

Climb performance is competent, but unremarkable. The Arrow is not a STOL airplane, but it doesn't eat up runway, either. During letdowns, the Arrow's gear serves as an effective speed brake. The gear extension limit is close to the cruise speed (which really says more about the cruise speed than it does about the gear), so descents aren't the problem they are in slick airplanes like the Mooney.

ACCOMMODATIONS

The Arrow's interior is quite comfortable. Piper deserves mention for its seat design in later aircraft, which have a crashworthy S-tube design meant to progressively collapse and absorb energy during an impact. This same basic design is used in the JAARS bush-plane seat. Piper also gets crashworthiness kudos for installing a thickly padded glareshield.

Heating and ventilation are both quite good, unlike some other airplanes in the class, with lots of overhead and floor vents. Egress is not the best, we don't like the single cabin door, especially when compared to the double-doored Cardinal RG, Cutlass RG, Commander 112 and the Beech Sierra. Further, the double-latch system can confuse passengers, particularly in an emergency: Be sure to brief them.

Piper chose long ago to put the engine gauges near the power controls, which makes a certain amount of sense except when setting and monitoring power on takeoff. We'd rather see the gauges up in the pilot's line of sight where they're hard to miss.

GEAR TROUBLES

The Arrow's automatic landing gear extension system was intended as a safety feature; Piper touted the Arrow as the perfect airplane for pilots transitioning to retractables. Many pilots and insurance underwriters embraced the "foolproof" gear system with some insurers even assigning lower rates. Alas, the system isn't perfect, and didn't prevent landing gear-related mishaps in the Arrow.

Also the Arrow's automatic gear extension system is a good example of how safety features can spawn new hazards even while eliminating old ones. In high-power, low-airspeed configurations, the system could either delay retraction or lower the gear at an unwanted time.

Then there are Arrow pilots who lose their engines and decide to ditch with the gear up. Unfortunately, some forget to override the

ACCIDENTS: ENGINES AND R-LOC

Since Piper's entry-level retractable serves a variety of mission profiles, we weren't surprised to find a wide variety of accident causes in the 100 NTSB reports we surveyed. What was surprising, however, is the number of engine-related issues—27 percent—which led the crash parade.

We looked at both normally aspirated Lycoming as well as turbo Continental-powered models, and while we couldn't see a pattern that tainted either engine, sloppy maintenance issues were to blame for too many wrecked Arrows.

For example, there were a couple of instances of oil exhaustion—the result of missing and incorrectly installed oil quick-drains and accessory drive fittings. There were a few cases of incorrectly installed cylinders, which ultimately departed the engine, as well as fatigue failure of cylinder attachment studs, due to improper torque settings.

In the latter, the aircraft's owner, according to the NTSB, didn't help matters by continuing to fly the aircraft despite excessive oil leakage. In the careless mechanic department, we found several crashes thatt were the result of improperly installed engine cowlings and, speaking of cowlings, one disconnected intake manifold, which was found laying in the bottom of one crashed Arrow's engine cowling.

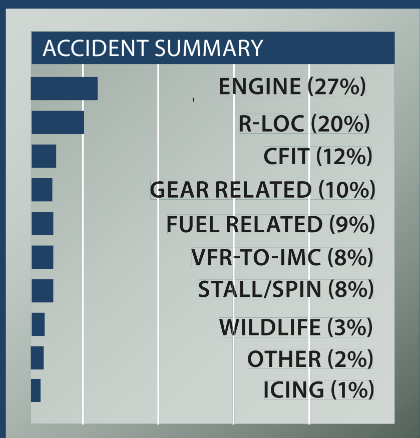
Since the PA28R series is often used as step-up, complex trainers, it's inevitable that some will get away from its pilot. That's likely why runway loss of controls (R-LOC) came in second, at 20 percent. The Arrow is often regarded as a basic Cherokee, except with retractable gear and variable pitch propeller, but it's also heavier and has more power than lesser models in the PA28 family.

The result, as the reports show, is a healthy number of unplanned runway excursions, even with instructors sitting shotgun and supposedly minding the farm. In fact, a couple of students inexplicably retracted the landing gear during the landing rollout. You can guess the outcome. Speaking of landing gear, despite the Arrow's automatic gear extension system, some Arrow drivers still manage to land with the wheels up, especially in ones with the auto-extension system disabled.

Since the Arrow is often used as a traveling machine, there was a handful of continued VFR into IMC crashes, and a whopping 16 percent that flew into terrain while either en route, on instrument approaches or on departure.

One Arrow augered into terrain shortly after takeoff while its pilot became distracted trying to troubleshoot a gear retraction problem.

While the Arrow may be thought of as one of the simpler complex airplanes, our accident scan—which uncovered 23 fatal crashes—proves that it's complex enough to make deadly accident reports, which is hardly the fault of the airplane.



automatic extension system. The gear plops out seconds before splash down—sending the Arrow head over heels. Savvy Arrow pilots learned early on to "pin"—override—the system to keep the gear retracted when doing any sort of max-performance work.

There is a second pitot tube, located on the left side of the cabin, for the automatic gear system. If it is equipped with pitot heat, it should be checked, along with the primary pitot tube before flight, as more than one pilot making a high-speed, IFR descent through a thin stratus layer has had the gear suddenly extend because that second pitot froze over.

There were enough "misunderstandings" by mid-1987 that Piper, then owned by Lear-Siegler, ordered the system deactivated because of concern over liability suits. It sold kits to do so, and told customers it wouldn't provide parts to repair the existing system. Piper sold 1400 kits.

A year later—then owned by M. Stuart Millar—the company withdrew its deactivation order, provided that pilots "take the necessary actions to assure that any pilot flying these aircraft are fully advised of the system and its proper operation." In part, Piper was responding to the complaints of irate owners who believed the system worked often enough to be desirable.

THAT TROUBLESOME TURBO

When Piper hung a 200-HP turbocharged Continental TSIO-360-F onto an Arrow III in 1977, the combination looked like a perfect match: the world's premier economy retractable single and a powerplant promising high-tech performance at low-tech prices.

The extra money—the average 1977 Turbo Arrow III went out the door costing around $4600 more than its non-turbo'd sibling—boosted book max cruise speed from 149 KTAS to a whopping 177 at altitude. A new cowling rounded out the deal and announced to the ramp rats your bird was turbocharged.

Soon, however, the engine began

earning a reputation as tricky to operate and prone to self destruction. It didn't help much when, in 1979, Piper combined its T-tail airframe with the turbo'd engine, even if the powerplant got a different suffix and much-needed TBO extension (from 1400 to 1800 hours).

The result was a handful on the runway: The T-tail's tendency to encourage overrotation, coupled with the engine's need for attention on the takeoff roll meant a busy time, especially on high-elevation fields. On the good side: The engine's fixed wastegate introduced legions of pilots to the term "bootstrapping." For pilots transitioning from a normally aspirated Arrow, it was too tempting to run the throttle to its stop early in the takeoff roll, just as one would with the non-turbo'd version.

Do that with the Turbo Arrow, though, and you'd get a red "overboost" light very soon, often followed by your mechanic's bill for the subsequent inspection. Instead, the favored technique was to run up the MAP to no more than 30 or so inches early in the takeoff roll, then forget about it while monitoring the other engine gauges and keeping the centerline straddled.

When workload permitted—or runway length demanded—and after the system spooled itself up to around 35 inches, a gentle nudge to the throttle gave around 39 or 40 inches; and then the engine likely would boost itself the rest of the way to its 41 inches of manifold pressure limit and off you went.

Alas, the engine wasn't as bulletproof as Continental intended or Piper hoped. One five-year printout of FAA Accident and Incident Reports for the Turbo Arrow disclosed no fewer than 54 instances of powerplant failures. Furthermore, the engine stoppages weren't the result of typical pilot errors such as fuel mismanagement, fuel exhaustion, etc. They occurred from failed connecting rods or rod bolts, broken crankshafts and damaged pistons.

Things got so bad that the National Transportation Safety Board in 1985 called for an airworthiness design review of the engine, citing a litany of component failures. Then-FAA Administrator Donald Engen rejected the request.

These days, things have calmed way down with the Turbo Arrow. A recent check of Service Difficulty Reports (SDRs) going back into the 1990s did not uncover any real trends with the Turbo Arrow's engine, airframe or appliances.

TURBO MODS

One of the reasons for the Turbo Arrow's recent reliability may be the aftermarket mods available. Two are significant: intercoolers and an automatic wastegate. Turboplus (www.turboplus.com) and Airflow Systems (www.airflow-systems.com) offer intercoolers. At 12,000 feet, the Turbo Arrow has a fairly low critical altitude—the max altitude at which the engine will develop its rated horsepower. Owners say they get a higher critical altitude with the intercoolers, along with lower operating temperatures.

Meanwhile, in an effort to prevent bootstrapping on the Turbo Arrow and other aircraft with the TSIO-360 engine, Merlyn Products (www.merlynproducts.com) has taken an even more dramatic step and come up with an automatic upper deck controller that looks like the answer to a prayer for Turbo Arrow owners. It increases the critical altitude by 5500 feet while boosting cruise climb and speed slightly, and lowering CHT and oil temperatures significantly.

The ostensibly nifty benefits of this system are much lower turbo speeds, lower engine RPM settings at all altitudes and generally allowing lower engine operating temperatures.

CLUBS, MORE MODS

A variety of aerodynamic mods are available for PA-28s, from the usual flap and gap seals (Knots-2U, www.knots2u.com) to shoulder harnesses (AeroParadise, www.aeroparadisellc.com) to the high-spiff-factor LoPresti (www.speedmods.com) cowling. Speed brakes can be had from Precise Flight (www.preciseflight.com), though the Arrow doesn't really need them.

As with any personal airplane, we strongly recommend joining a type club. Their expertise can save real money when tracking down common problems. Arrow owners have two excellent organizations from which to choose: the Cherokee Pilots Association (www.piperowner.com)

User opinions vary widely as to whether the T-tail changed handling characteristics.

and the Piper Owner Society (www.piperowner.org).

OWNER COMMENTS

I bought my 1973 Arrow II with Knots2U speed modifications in December of 1999. With the speed mods, I file for a true airspeed of 140 knots. I find that I need to plan ahead to slow the aircraft from cruise, unlike the Arrows I flew without the mods. However, once slowed, the aircraft has the sink rate of a typical Arrow. This took a little adjustment at first.

Since buying the airplane, I've upgraded the paint, avionics and interior and had to replace the prop because of an AD. The aircraft has been a joy, with no extraordinary, massive expenses, other than the paint, avionics and interior, which were my choices.

I first started flying 180-HP Arrows in the 1970s and flew an Arrow to Alaska from Chicago, camping out beside the aircraft. My only complaint is that it would be nice to have a 180- or 200-knot aircraft, but I don't see that happening any time soon.

Maurice Givens
Via email

I purchased my 1976 Arrow II back in 1998 for $62,000—in the good old days of ever-increasing resale values—after earning my instrument rating. It had never been used as a trainer and was therefore in very good condition, which can be hard to find in this model.

Over the years, I thought many times about upgrading again to a Bonanza F33 or Mooney J model. However, I realized that the Arrow was really perfect for my typical 300-mile or shorter mission. While not as fast as a Mooney or Bonanza, it is more efficient and more comfortable. Compared to a Mooney, it can carry plenty of weight fully fueled—fill the tanks and you can still carry four average adults or two adults and plenty of baggage, and it is far cheaper to operate.

It is fast enough as a short- to medium-range cross-country airplane. While 140 knots is possible at max power, I typically flight plan 135 knots at 65-70 percent power on 10 GPH. For the extra few knots a Mooney might deliver, the Arrow is a more comfortable and pleasurable plane to fly.

The Arrow has no handling quirks or bad habits and is a joy to fly. The only drawback I have found is the 48-gallon useful fuel capacity of the Arrow II—an issue that was rectified in the Arrow III with the adoption of the tapered wing and 68 gallon tanks. But I can still get four hours plus reserves—which is plenty for my usual flights.

While the tapered wing Arrow III is generally considered more desirable, having flown both I have noted little difference in performance or handling. I currently have over 1300 hours on the engine, and compressions and oil consumption have remained relatively constant. It has been a very reliable and relatively inexpensive airplane to maintain. I have never had to cancel a planned flight due to maintenance issues.

Parts are plentiful and inexpensive compared to Beech or Mooney parts, and the Lycoming IO-360 is bulletproof. Parts availability and factory support is a given. Reliability is due in part to simple mechanical systems and design. In all my 14 years of ownership, I have never had a retractable gear maintenance issue.

Having decided to keep the aircraft rather than replace it, I have had it completely updated over the last two years, including new custom paint and interior by Central Aviation in Watertown, Wisconsin, and a new panel by JA Air Center in Aurora, Illinois. The interior refurbishment included all-new plastic trim, overhead console and headliner, along with leather-wrapped control wheels.

The new panel consists of a custom metal upper panel with instrument bezel lighting, replacing the old plastic overlays. I installed a new Aspen PFD and replaced the aging King radios with a new Garmin stack, including GMA 340 audio panel, GTN 650 GPS/Nav/Comm, GTX 330 Mode S transponder with TIS traffic, S-Tec 60-2 autopilot wired through the Aspen for GPS roll steering and a panel-mounted, hardwired Garmin Aera 560 that displays XM datalink weather and plays XM radio through the audio panel.

I retained an original KX-170B with the MAC 1700 digital tuner conversion as my No. 2 navcomm along with the original Narco DME. I also retained the WX-900 Stormscope. With these upgrades, my aging Arrow is now a reliable, capable, modern aircraft that is efficient and functional for both local and cross-country flying.

With respect to costs of ownership, my annual insurance premium is around $1300 for $1 million smooth liability and $115,000 hull value. I upped the hull value after the panel upgrades—insurance for the average Arrow would be much less. Annuals usually run in the range of $2000–$2500. Little maintenance is typically required between annuals. I would estimate average yearly maintenance costs at around $3000.

I know that I would not recover the cost of my recent upgrades if I were to sell, but I have decided this Arrow is a keeper. It may not be an airplane that is really great at any one thing—there are faster planes and better load-hauling planes. But it is reasonably good at a lot of things—a great combination of acceptable speed, decent payload, efficiency and low operating costs.

I think the Arrow is great for efficient, low-cost, cross-country transportation. I encourage anyone considering one to buy. The only caveat would be to try and find one that has not spent its life being beaten on as a trainer or rental, which can be a challenge since Arrows are very popular for those uses.

Bryan Sill
Naperville, Illinois

Engine management was probably the largest burden I faced in my transition from a rental Cessna 172 to my purchased Turbo Arrow.

My recommendation is to force yourself to get in the habit of checking the engine instruments often. Include them in your scan, and look at them after every configuration change.

During takeoff roll, ease the throttle forward to increase RPM, allowing the turbo to spool up. This will smooth the effects of P Factor and you will not require as much rudder input as you would if you just threw the throttle into position. As you feel the turbo "kick in," ease the throttle forward to achieve recommended takeoff manifold pressure.

After rotation, double check manifold pressure and adjust as needed. Check the manifold pressure as you retract the flaps. Again, as the gear is retracted, keep an eye on the manifold pressure.

The throttle is very touchy on the Turbo Arrow, and what you may think is a minimal change will actually be a huge change. So easy, tiny movements on the throttle are required.

Dason Rapp
Via e-mail

I am the chief instructor for the Aspen Flying Club at Denver Centennial Airport. The club has owned and operated a Turbo Arrow for several years. In my opinion, the PA-28 201RT is one of the best airplanes for the money. I think that you can readily find them in a variety of conditions and diversely equipped.

Consider the comparison of a Cirrus SR22 vs. a Turbo Arrow. A Turbo Arrow costs several hundred thousand dollars less to acquire, is just a couple of 10s of knots slower and burns two-thirds the fuel. My experience is that the Turbo Arrow is a high density-altitude, go-anywhere Colorado aircraft.

Our club checkout process isn't that difficult. To start, the policy requires all pilots to have a total time of 125 hours with 25 hours of retractable gear time or 10 hours in make and model and a checkout flight after passing a written aircraft checkout quiz. We have had some maintenance issues due to improper operation of the airplane, so we may need to increase those times.

We have a document created by the owner of the airplane—it's on leaseback—that discusses the particularities of the Turbo Arrow. Each renter is required to read this and sign it before the checkout. Additionally, each unique component's information manual is available on the club's website page for the Turbo Arrow. Each renter is expected to become familiar with the functions of these components. Lastly, we require our members to watch a video on turbocharged engine operations.

The majority of the checkout flight is routine. We will do slow flight, approach and departure stalls and recoveries, simulated engine failure and a handful of touch-and-goes. Because of the capabilities of this aircraft, we include at least one high-altitude flight. This allows the pilot to understand the use of supplemental oxygen as well as turbo operation where it matters.

Michael Shannon
Via email

The Aviation Consumer

King Katmai

(continued from page 19)

it is difficult to make a landing that is other than firm. A number of STOL airplanes we have flown require a great deal of power to check the descent and flare for landing—that was not the case with the King Katmai. In fact, it was initially challenging to avoid using too much power in the flare—the airplane will float.

OFF-AIRPORT

We made a number of landings and takeoffs on what Peterson described as "Jeep trails" in the prairie of the Flint Hills east of his home base of El Dorado, Kansas. These were winding, rutted dirt vehicle trails used by ranchers to oversee livestock. We were able to find sections that were more or less straight and reasonably level for about 400 feet or so, with clear approaches.

The normal procedure of approaching with 20 degrees of flap, power as needed, and assuring the control wheel was full aft prior to touchdown resulted in landings within 50 feet of the desired spot. Power was reduced to idle at touchdown and heavy braking immediately applied, to the point of sliding the tires. The nose blocked forward visibility during the few moments of the flare, but came down immediately after touchdown, allowing clear view of the surface ahead and for us to easily steer around potholes and obstructions.

Landings were made at various angles to a 10- to 15-knot wind, including a 90-degree crosswind. At no time did we need more than 300 feet to get stopped from the point of touchdown.

Peterson told us that some buyers never intend to land off airport with their airplanes. They buy the mod simply because of the substantial reduction in stall speed and increased level of safety they have by having a greater margin above stall speed in normal operations.

Peterson provides a number of videos on the company website that describe the capabilities and operating procedures for the 260SE series of mods. We found them to be concise, well done and informative.

OPTIONS

The number of options for the Peterson conversions is initially daunting. We found it best to think of them as two lines of conversions—the 260SE and its outgrowths and the Katmai series (everything includes the canard, which is the underlying basis of the line of mods). The difference between the two is the extended wing—all Katmais, no matter what engine size or landing gear selected, have the extended wing with its reduced stall speed. The 260SE series, no matter what engine size or landing gear configuration, does not have the extended wing.

Once the decision is made as to whether to go with the extended wing, it's a matter of deciding on speed mods, engine (stock 230 HP, 260 HP or 300 HP), landing gear and incidentals such as extended baggage area, increased gross weight and a Honda generator for power in the back country. Peterson will buy a 182 to convert or use what the buyer provides, so long as it's in decent, airworthy condition. His company will also subcontract such refurbishment and upgrades, including avionics as the buyer desires.

We were impressed with the quality of work on the finished airplanes we saw and with the handling and performance of the King Katmai. We came to the conclusion that the aerodynamic price for the benefits of the canard was a slight increase in wetted area and drag and the weight of the installation. Pitch forces were linear, without disruption, in all portions of the envelope we explored. The King Katmai appears to be a well-engineered, well-built mod that is well suited to anything from the busiest airport to the most remote airstrip.

FEEDBACK WANTED

PIPER AZTEC

For the April 2013 issue of *Aviation Consumer*, our Used Aircraft Guide will be on the Piper PA23 Apache/Aztec/Geronimo series, the original Piper twins and the most common mod. We want to know what it's like to own these planes, how much they cost to operate, maintain and insure and what they're like to fly. If you'd like your airplane to appear in the magazine, send us any photographs 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 PA23 series by February 1, 2013, to:

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