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

**AVIATION CONSUMER**  
(ISSN #0147-9911) is published monthly by Belvoir Aviation Group LLC, an affiliate of Belvoir Media Group, 535 Connecticut Avenue, Norwalk, CT 06854-1713. Robert Englander, Chairman and CEO; Timothy H. Cole, Executive Vice President, Editorial Director; Philip L. Penny, Chief Operating Officer; Greg King, Executive Vice President, Marketing Director; Ron Goldberg, Chief Financial Officer; Tom Canfield, Vice President, Circulation.

Periodicals postage paid at Norwalk, CT, and at additional mailing offices. Revenue Canada GST Account #128044658. Subscriptions: \$84 annually. Bulk rate subscriptions for organizations are available. Copyright © 2016 Belvoir Aviation Group LLC. All rights reserved. Reproduction in whole or in part is prohibited. Printed in the USA.

Postmaster: Send address corrections to AVIATION CONSUMER, P.O. Box 8535, Big Sandy, TX 75755-8535. In Canada, P.O. Box 39 Norwich, ON NO1J1PO, Canada. Publishing Agreement Number #40016479

## FIRST WORD

### THE CROSSOVER AVIONICS MARKET

It's time to drop the ambiguous "experimental" label that follows avionics without a TSO and ones that started life in the experimental aircraft category. Is the experiment whether or not the equipment is going to kill you while flying in the clag? I think we're past all that. Besides, the FAA's experimental category is for aircraft and includes special airworthiness certification issued to operate an aircraft that doesn't have a type certificate. There's really no category for avionics. But there are STCs and the FAA is now issuing them for so-called experimental avionics—or those not previously approved for installation in type-certified aircraft. Perhaps we can call this new breed crossover avionics, since they cross the market line.



As we reported in the May 2016 issue of *Aviation Consumer*, the announcement by the EAA (Experimental Aircraft Association) and Dynon Avionics that it earned FAA STC approval to install Dynon's non-certified EFIS-D10A system in a variety of FAA-certified aircraft (through an approved model list, or AML) is a breakthrough for affordable avionics in existing Part 23 aircraft. In my 30-plus years working in this industry, I'm not sure I've witnessed an announcement of this proportion. EAA Chairman Jack Pelton said there are more products that will eventually cross the market and follow the D10A into the panels of certified aircraft.

The EAA/Dynon regulatory home run opens the doors for other avionics manufacturers—including Garmin—to earn their own STCs for installation of uncertified avionics. You can bet they are already busy making this happen. For well-established companies like Garmin (with plenty of experience earning STC approvals), it should be easy, but perhaps not so easy for new companies. Earning an STC is no easy task and EAA's Pelton made it clear that it won't be a free-for-all and the FAA will be selective. Like Dynon's D10A (it had a 10-year run), I suspect existing products will have the advantage when it comes to winning an STC.

Garmin's G3X Touch integrated experimental avionics suite (that's the G3X Touch installed in a Lancair Evolution turboprop pictured above) is one system that I'm certain we'll eventually see, in one form or another, installed in mainstream Part 23 aircraft, both as OEM equipment and for aftermarket retrofit. On a more basic level—and as a potential direct competitor for Dynon's D10A retrofit EFIS—is Garmin's \$2000 uncertified G5 electronic flight instrument. You can read all about the G5 starting on page 21 of this issue.

After evaluating the G5 in Garmin's RV-7 during a recent factory visit, someone asked if I thought the G5 flight instrument was worthy for installation in a certified aircraft because, after all, it's for experimentals. That's a silly question because if the instrument is good enough for an airplane like the RV-7—and countless other experimental models that fly in actual IFR conditions—it's surely worthy for installation in a Bonanza, Skylane, M20J and countless other familiar Part 23 models that fly in the same conditions. Since it granted Dynon the AML-STC for the D10A EFIS for primary, standalone use (VFR and IFR), the FAA obviously concurs. Why the change of heart after years of regulatory roadblocks? Progress, that's why.

Paul Dye, my counterpart at sister publication *Kitplanes* and an expert on all things in the experimental market, reminded me that the agency can't continue to ignore uncertified EFIS systems. Even despite not knowing the parts or software pedigree, the FAA's creative talent (there are plenty of forward thinkers) recognize that uncertified equipment is miles ahead of even the best vacuum-driven systems in terms of reliability. Bleeding uncertified equipment into the Part 23 market is merely a bonus for folks with lower-end aircraft who can't afford the prices of certified hardware. It's about time an alphabet group stepped up to make it happen. A tip of the editorial hat to EAA for tearing down a barrier and creating the new crossover market segment.—Larry Anglisano

**BUSTING THE REGS**

I'll weigh in on Larry Anglisano's commentary on pilots ignoring FAA regulations (May 2016 *Aviation Consumer*). The social contract results in the people obeying the laws, when the laws respect the people. Prohibition is the perfect example for when this agreement failed.



Zealots imposed their ascetic dogma on the population, who did not want their lifestyles constricted. Utter disregard for this law ensued, which resulted in a generalized breakdown of respect for all laws, with consequential corruption and crime.

Similarly, when the FAA imposes rules that have no foundation or scientific basis that they improve safety, but exist solely to restrict the freedom of pilots, they will be ignored and the FAA perceived as a sanctimonious tyrant, rather than a respected promoter of safety.

For example, the arbitrary restriction of LSA weight to 1320 pounds has perhaps made these aircraft too light and flimsy to be as safe as they should and with too little useful load to fly two pilots. As you pointed out in your series of articles on Carbon Cubs and Super Legend HPs, most LSAs are flown overweight, especially when they're engineered as EAB planes to have gross weights of 1800 pounds.

The requirement of a third class medical, which has been shown to provide absolutely no safety enhancement over a drivers license medical, has disenfranchised many private pilots, hurting general aviation.

Yes, pilots are developing a general disregard for all regs—including the good ones—to the detriment of all.

Barry Gloger  
Forest Hills, New York

You stated the obvious in your last issue's First Word commentary about

pilots blowing off the regulations. I have to agree with the fellow reader who thinks older pilots are inclined to do what they want. I've witnessed more than one senior at my local airport do just that over the years. Luckily they don't fly any longer, but I wasn't the only one who believed they were

flying (one in a high-performance twin) without a medical.

I don't care if dishonest pilots like this break the rules—human nature happens—just don't kill me and my passengers in the process.

Todd Santini  
via email

**GARMIN 660 WEATHER**

That was a tantalizing teaser about the new Garmin aera 660 portable GPS in the sidebar in the April 2016 issue of *Aviation Consumer*.

It's worth noting that it apparently doesn't (yet?) receive XM weather data. That's odd, since all of Garmin's recent predecessors came with an XM antenna/receiver module in the box and displayed XM satellite weather data from the beginning.

ADS-B weather may eventually render XM-delivered weather obsolete, but given its limitations so far, it hasn't yet, particularly for those of us who rely on a Garmin portable GPS as a backup to a panel-mount GPS and ADS-B capability.

Stephen D Leonard  
Boise, Idaho

*We're planning a full review of the Garmin aera 660 in an upcoming issue. In the meantime, we asked Garmin about the lack of XM capability on the current 660 and they told us customers can expect an SXM (SiriusXM) weather and entertainment solution on the device later this year.*

**WHO CAN INSTALL ADS-B?**

I find your ADS-B coverage very

informative, but I have a question that's never been answered: Can an A&P with an IA rating install an ADS-B Out Mode S transponder in a Part 23 certified aircraft, or does it absolutely need to be installed by an avionics shop?

Fred Wellman  
via email

*As long as the ADS-B system (including an ADS-B Out transponder) has an STC and the aircraft is on the AML (approved model list) there shouldn't be any reason why an A&P with IA privileges can't do the install, sign it off in the logbooks, create a flight manual supplement, plus update the aircraft weight and balance and equipment list.*

*From a regulatory standpoint, an avionics shop generally signs off an installation under its FAA repair station certificate, while an IA signs it off with his or her own certificate.*

*But, it's worth mentioning that the transponder will need to be tested and certified per FAR 91.413. Few maintenance shops have the required (and calibrated) equipment to do this. That's why the task is usually left for an avionics shop to tackle.*

*Last, given the level of avionics integration that generally exists during the installation, you'll want to be sure the A&P has current installation manuals, is qualified with a manufacturer-approved dealership and has the ability to upgrade software to make it all play.*

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# Icon Purchase Terms: The New Normal?

*The intensely company-centric terms of the newly released purchase agreement for the Icon A5 are unprecedented. What does this portend for the future?*

by Rick Durden and Paul Bertorelli

Just as Sun 'n Fun was opening in April, Icon Aircraft—a company that aims to reset the entire general aviation industry with the flashy light sport A5 amphibian—stunned its position holders with a detailed purchase agreement that would all but absolve the company of any liability exposure of any kind.

The extent of Icon's contract—it runs to 40 pages—even specified sharp restrictions on the secondary sale of the airplane by the original purchaser. Icon's agreement was

obviously an attempt to protect the company in what many consider to still be a hostile tort environment, despite the enactment of the General Aviation Revitalization Act in 1994 that was supposed to give aircraft

manufacturers relief from spurious lawsuits and to reduce their products liability insurance costs. Whether

the Icon purchase agreement would do that is an open question, but one thing is clear to us: Icon's contract drew plenty of comments and opened a discussion in the industry

*Icon's contract drew plenty of comments and opened a discussion in the industry about the state of liability exposure for manufacturers.*

about the state of liability exposure for manufacturers. Before Sun 'n Fun had closed, Icon acknowledged that it had heard customers "loud and clear" and would consider changes or at least explain the buyer's agreement.

## COMPANY-CENTRIC

Icon was launched in 2006 with the stated goal of revolutionizing the general aviation industry with a sexy, two-place sport amphibian marketed not through traditional aviation channels but using methods common to the motorsports market. Icon also promised new business practices and its buyer agreement certainly qualified. The 40-page document is too voluminous to reproduce here, but here are some highlights.

- Buyers agree not to sue Icon or, if they wish that right, they can pay an additional \$10,000.
- Icon makes no claim about the aircraft being suitable for any purpose and insists that it's not responsible for any claims made in sales material or by salespeople, other than what's in the POH.
- Pilots must be trained by Icon or an Icon-approved program. They must agree to retain a "managing pilot" who assures adherence to strict operating practices.
- The owner agrees to operate a flight recorder and camera at all times and to maintain it at his own expense.
- The airframe is required to be overhauled at 2000 hours or 10 years, whichever is shorter, but no price is given for the overhaul. The airframe is life-limited to 6000 hours.
- The airplane's higher-weight-than-standard LSA is approved only in the U.S. and Icon says buyers in other countries are on their own with their own regulators. Icon's contract says it may never publish a schedule on such approvals.
- The contract requires the owner to agree that the contract itself was "negotiated" between the owner and company and therefore, if there is a disagreement, the owner can't claim the contract was actually take it or leave it.



*Icon A5 at Sun 'n Fun, left. The company claims more than 2000 orders and promises to build 175 airplanes in 2016.*

- Buyers agree that upon selling the airplane, they will assure the new buyer adheres to the original purchase agreement and pay Icon \$2000 to process the agreement or \$5000 for failing to do so. Icon also reserves the right of first refusal at market prices it sets.

### WILL THIS HOLD UP?

Lawyers we spoke to said Icon's contract was so complex that adjudicating it in court might be difficult. Such attempts at all-encompassing waivers may or may not stand against a determined plaintiff. The closest corollary we can think of is the skydiving industry, which requires detailed, multi-page waivers for all participants. These have generally withstood attempts to pierce them, but they relate to services, not products.

Having said that, Icon's agreement has some clauses we think are problematical, if not downright untenable. For example, the buyer and the "managing pilot" agree to release Icon from liability unless the NTSB finds that "the"—not just "a"—probable cause of an accident was a defect in something that Icon made or in its training.

However, federal law prohibits the NTSB's probable cause report from being introduced into evidence in a lawsuit over the accident it referenced. That's to keep NTSB investigators from being pressured, coerced or bribed when doing their aviation safety work. The Icon contract requires the buyer to waive this law. We question if it's possible to waive a federal statute.

NTSB probable cause findings often find more than one cause—because accidents rarely have a single cause. Therefore, if the NTSB finds a defect for which Icon is responsible and also finds another cause or condition, does that take Icon off the hook?

When it comes to the buyer waiving the protection of laws, the purchase agreement also requires that the buyer waive any right to jury trial and take any disagreement to arbitration in San Francisco. To the extent a buyer may be able to sue Icon, the purchase agreement appears to have the buyer agree to do so only in specific courts in California. However, California law prohibits a release and waiver by a person of legal rights to

a claim that person doesn't yet know exists. The buyer agreement requires the buyer to waive the protections of that law.

The buyer can opt out of the covenant not to sue, by paying Icon \$10,000. However, in our view, other sections of the agreement appear to mean that the buyer has already agreed that he'll automatically lose any lawsuit he brings. In the aircraft operating agreement portion of the contract, the buyer acknowledges that flying is risky and that injuries or death could result from a number of factors—which are then listed. The list includes "defects in the aircraft or components." The buyer and managing pilot then specifically agree to "...assume these risks on behalf of themselves and their successors in interest."

In most states, assumption of the risk by the injured party is a defense to a lawsuit brought by that party against the manufacturer. It appears to us that even if a buyer spends the money to retain the right to pursue legal action against Icon, the buyer has handed a perfect defense to the company by admitting assumption of the risk.

We don't know if insurance companies will start writing policies that cover an Icon A5 owner for his or her obligation to indemnify Icon if someone sues the company after the owner has an accident. We suspect there aren't enough A5s out there for insurers to estimate a reasonable risk pool.

### IS THIS WHAT'S COMING?

Some in the industry believe that Icon's purchase agreement is the leading edge of standard buyer contracts of the future. We're not so sure. But Icon isn't the first. A few years ago, Avidyne offered a new extended warranty program that required that



*Thanks to masterful promotion, the A5 has proven a hit with the daily press, top. Aviation publications who've flown it have given it high praise. Aviation Consumer has not been permitted to fly the A5.*

the aircraft owner sign an agreement not to sue if he or she has an accident unless the NTSB finds that the Avidyne box was defective and caused the accident—and to pay for Avidyne's defense should someone else sue. We reviewed the warranty terms and Avidyne's concern over product liability costs in the August 2013 issue of *Aviation Consumer*. We view such an agreement as problematical.

Defending a manufacturer would probably bankrupt the aircraft owner. We noted that Avidyne did offer a carrot-and-stick approach—if the owner agreed to the clause (which was optional) to indemnify and defend Avidyne, the owner got a better deal on maintenance costs.

At the recent Aero show in Germa-

## THE EFFECTS OF THE GARA

The General Aviation Revitalization Act (GARA) was signed into law in 1994 to reduce the long product liability “tail” or exposure faced by general aviation manufacturers who had been building airplanes for an extended period of time. The exposure was daunting: There were airplanes still flying that had been built as far back as the 1920s (Cessna) or 1930s (Piper and Beechcraft). Most were being flown by amateur pilots and each one represented a potential lawsuit against its manufacturer.

Manufacturers have always been reluctant to disclose the number of lawsuits they are defending at any one time, their costs or the amounts they pay in the process of defending and resolving suits. A knowledgeable source told us that in the 1980s Cessna was facing an average of 500 lawsuits and claims at any given time. The Bureau of Labor Statistics said that by 1985 a manufacturer’s product liability insurance averaged \$100,000 per airplane it sold. The price of insurance does not reflect the actual cost of product liability faced by manufacturers because many had deductibles in the millions, had to hire specialized employees to do research necessary to defend suits and faced diversion of the top engineers from productive work as they were called to testify in the cases.

The GARA established a statute of repose—18 years after a general aviation aircraft was sold to the first buyer it was presumed to have demonstrated that it was safe and, with limited exceptions, the manufacturer of the aircraft and its components could no longer be sued if the aircraft crashed.

The notable exceptions were for a medical transport crash and if the manufacturer had misrepresented information to the FAA in the certification process (often called the fraud or the FAA exception). If a new component were installed on the aircraft, the 18-year count-

down started again, but just for that component.

The immediate effect of the GARA was that the number of lawsuits filed against aircraft and component manufacturers plummeted.

Lawsuit numbers are not published; however, we observed over the next 10 years that a number of attorneys who had been litigating aviation accident cases full-time on either the plaintiff or defendant side moved into other areas of practice because the number of cases dropped off so radically.

At the same time, many states passed tort reform legislation making it more difficult to prove a product liability case and/or putting limits on what an injured party could recover. One longtime aviation plaintiff attorney we spoke to (who asked that his name not be used) said that for every 10 cases he reviews, he accepts one because he knows it will be expensive to bring the case and the GARA and other tort reform laws have made it tougher to bring suits.

One of the hoped-for effects of the GARA was a reduction in the price of new airplanes. That didn’t happen. Another effect was that when the “deep pocket” of the manufacturer was taken away as a target for older airplane crashes, there was an increased willingness for plaintiffs to go after maintenance shops and the most common cause of the crash, the pilot. In some cases, it turned out that for a pilot who had the financial wherewithal to own an airplane, he or his estate had enough assets to become a target that, pre-GARA, would have been avoided.

Because the GARA does not affect manufacturers until airplanes they have built turn 18, it has no effect on younger aircraft companies—although it does allow the legacy companies with thousands of airplanes in the field to compete on a more level cost basis with those younger companies.

ny, we spoke to a number of aircraft manufacturing executives who were, not surprisingly, warm toward Icon’s attempt at reducing its exposure.

However, none thought it was practical or realistic or perhaps even necessary. Christian Dries of Diamond may have summed it up best: “The product liability insurance for this product is so high, that this is the only way to reduce it...to have some kind of contract. I have considered even much worse things, but I know my customers would never accept it, therefore, we are not talking about it.” Dries points out that Diamond doesn’t have to think about this issue for its business in Europe. “This is completely unique to the United States,” Dries said.

All of the executives we spoke to liked the idea of the flight recorder, as do we, as a means of both promoting safety and providing a manufacturer with data to conduct a defense. In fact, Cirrus already does this and Diamond’s FADEC-controlled diesels and Garmin avionics record data, making them de facto flight data recorders.

“It does make sense to have a recorder that’s survivable. It’s a good idea. But to require it is probably a bridge too far,” says GAMA President Pete Bunce. As for the contract itself, Bunce added, “I agree totally with the concept. It’s very difficult for us to have a system with all of the insurance companies to be able to discourage bad behavior which is, in many cases, caused completely by operator error.” But Bunce also said Icon’s rollout of its agreement was hardly ideal. “How it was deployed, I think from the public relations standpoint, they learned some things and they’ll correct over the next few months,” he added.

Are others exploring the same kind of draconian contract language? If so, none of the executives we spoke to would admit it. “We haven’t spent time exploring that. Our primary approach has been toward training and it’s not just that, it’s what we can do with the aircraft, having a complete safety system,” said Cirrus CEO Pat Waddick. “Whether it’s an airplane that’s easy to use or takes full advantage of the avionics or airplanes that have parachutes on them, we look at how those things are impacting safety,” Waddick says.

Daher's Nicolas Chabbert said the same thing in different words. "The most important thing to do is what are we doing now to make advances and that innovation is going to save lives," Chabbert said, pointing to the recent introduction of the TBM 930, which has aggressive envelope and hypoxia awareness protection.

Piper CEO Simon Caldecott agreed with Christian Dries on the practicality of hold harmless contracts with buyers. "I would like it, because it would take the onus away from me. But really, I think it would damage our sales significantly. I just don't think the individual is going to want to take that," Caldecott said of an Icon-like buyer agreement.

What would he like to see? A run by insurance companies to tackle liability exposure or outright tort reform aimed at aviation, just as the GARA legislation of 1994 attempted to do. Cirrus' Waddick and Lycoming's Michael Kraft had the same view. All would like to see the same sort of relatively benign tort environment that European manufacturers live with. And what better time to attempt such a thing than now, with a historically large general aviation caucus in Congress.

"Well, if you're talking about opening up GARA, that is fraught with peril," warns GAMA's Bunce. "We think we're powerful in our voice, but if you compare that to the trial lawyers, if we open things back up and we make things worse, that would be detrimental," Bunce says. "If we could do it judicially, without having to do it legislatively, that would be safer," he adds. And what that means is a court case that would mitigate the plaintiff's overwhelming advantage in aviation tort cases. Thus far, neither GARA nor individual court cases have provided companies with much relief.

## CONCLUSION

Icon has persistently declined to answer repeated queries from *Aviation Consumer* and our sister publication, *AVweb*. One interview was scheduled at Sun 'n Fun and then cancelled. As Sun 'n Fun closed, Icon CEO Kirk Hawkins released a single-page statement that said, in part, "We hear you—loud and clear. And I promise, we're listening carefully. This week at Sun 'n Fun has been very infor-

mative, hearing from both existing Icon customers and members of the aviation community. We are committed to assuring our customers fully understand the decisions we make and the intended benefits for all." In his statement, Hawkins said there had been "misinformation and misinterpretation" regarding the terms and motivation of the purchase agreement. Although Hawkins said Icon is committed to "open dialog with the Icon community and GA industry at large" its refusal to clarify the most basic questions from the press suggests, in our view, that it's not much interested in explaining itself.

While our interviews with industry leaders revealed a clear understanding and some support for what Icon is attempting, our interviews with two position holders revealed just the opposite. At Sun 'n Fun, one Icon customer told us he viewed the purchase agreement as utterly one-sided and was advised by an attorney not to sign it. He cancelled his A5 order and was considering placing an order for a Brazilian-made amphibian called the Super Petrel. "It's not as flashy, but they've actually got them in stock," he told us. A second position holder said he probably wouldn't retain his order.

While we agree with GAMA's Pete Bunce and others that trying to limit a company's exposure to product liability is laudable, we also agree with the Cirrus and Daher outlook on that: Building a community of trained pilots who are less likely to have accidents may be the best approach, combined with insuring whatever risk remains for the company.

Our advice to anyone holding a position for an Icon order is to have the terms of the agreement carefully reviewed by an



**Piper's Simon Caldecott on Icon-type agreements:** "I would like it, because it would take the onus away from me. But really, I think it would damage our sales significantly. I just don't think the individual is going to want to take that."

attorney before even considering executing it. It should also be reviewed by the company insuring the airplane. It's one thing to relieve a company of some or all liability for its own mistakes, but quite another for an owner to expose himself (and his wealth) to expensive lawsuits from the company itself or from aggrieved passengers. Unless this purchase agreement can be substantially renegotiated or made more buyer-friendly, our advice is to walk away from it.

**Cirrus' Pat Waddick:** "We haven't spent time exploring that. Our primary approach has been toward training and it's not just that, it's what we can do with the aircraft, having a complete safety system."





AIRCRAFT FLIGHT TRIAL

# Diamond DA62: Perfection at a Price

*At \$1.3 million, we would expect this new twin to deliver comfort and performance and it does. The engines are the most refined diesels yet.*

by Paul Bertorelli

**W**hen Diamond introduced an unlikely light twin nearly 15 years ago—diesel powered, no less—it seemed like a long shot. Yet the DA42 found surprising traction in a market no one knew was starved for economical trainers. With its new DA62 twin now flying the demo circuit, Diamond isn't expecting to repeat the trick in sheer sales numbers, thanks to a princely price and buyers far scarcer than they were a decade ago.

But even at over a million a copy, the DA62 is already attracting enough business to make it a market presence rivaling Piper's Seneca and Seminole and Beechcraft/Textron's G58 Baron, which shares a similar north-of-\$1.0-million price tag. While in its sales salad days, the DA42 sold as many as 160 units a year. After the bottom dropped out of the economy in 2008, Diamond moved a couple of dozen

twins a year to a combination of schools and private owners. It ran into a rough spot with the then-Thielert diesels in 2007, but eventually recovered with improved motors.

Given its luxury panache, the DA62 seems more likely to become the personal ride for owners wealthy enough to afford it. And given that it is, in our view, the most sophisticated airplane Diamond has ever offered, we think those buyers aren't likely to be disappointed.

## AERIAL SUV

When we first encountered the DA62 as a test article in 2013, its designator was the DA52, but only the name has changed. The basic airframe is a stretched version of the DA42 twin and, in fact, the DA62 resides on its progenitor's type certificate. At the time, Diamond CEO Christian Dries said he viewed the new twin as an

*The DA62 is built mostly of carbon fiber, so the days of white as the only color choice are gone. Dimensionally, the airplane is longer, wider and higher than the DA42.*

SUV or a minivan. It's certainly big enough for that. Up close, it stands higher than the original DA42 and it's two feet longer. It reminds us a bit of an Aztec, if an Aztec could be sculpted in carbon fiber.

The wingspan increases from 44.5 feet to 47.8 feet and the tips are up-swept. The top of the tail is a full foot higher than the DA42. For as noticeable as these changes are from the outside the airplane, the cabin interior is markedly larger in both width and length, thanks to a 5-inch plug inserted longitudinally between the two

## CHECKLIST



Handling, performance and detailing are all superb.



Single-engine performance is impressive; auto-feather makes it easy.



In an airplane this expensive, we'd like to see TBOs longer than 1000 hours.

fuselage halves. Ostensibly, this makes the DA62 a seven-seat airplane, with two up front, three in a wide bench seat that serves as a mid-row and two kiddie seats in the rear. But practically, it's a four-seater with prodigious baggage capacity or a five-seater with moderate range and surplus payload.

Where the original DA42 shared the forward-hinged bubble canopy introduced on the DA40 single, the DA62 has a pair of gullwing doors that hinge up out of the way for ingress and egress. For access to the rear, Diamond enlarged the left-side hatch to barn-door proportions and supports it with a spring mechanism to make it easy to open and close. Entering involves simply stepping down into the cabin from the wing.

The rear-most seats, which are a \$27,725 option, have more room than they appear to, but in our view, they shouldn't be considered adult accommodations. For one thing, they're tight for large people and for another, the airplane doesn't have the practical payload for seats-full flying.

## PAYLOAD, ERGOS

At 5071 pounds max gross, the DA62 is the largest, heaviest airplane Diamond has ever built and it doesn't lack for useful load. The example we flew had a useful load of about 1600 pounds. With 86 gallons of Jet A aboard, that translates to 1000 pounds of payload. That would accommodate seven if two of the passengers are kids weighing 75 pounds or so. More realistically, the DA62 is a four- or five-place airplane with all but unlimited baggage space. For example, with four aboard—even a heavy four—there's still payload for 200 pounds of baggage.

Because of European ATC regulatory limitations, there are two versions of the DA62 and the European version is limited to 4397 pounds, a whopping 674 pounds less than the North American version. That's more than the weight of the full fuel load and turns the airplane into a two- or three-placer with full fuel. Be glad you don't live in Europe. Speaking of fuel, the airplane has a 4850-pound zero fuel limit. So on an empty weight of 3471 pounds, 1379 pounds can go in the cabin, but the remaining 221 pounds must be fuel. That's about 32 gallons.

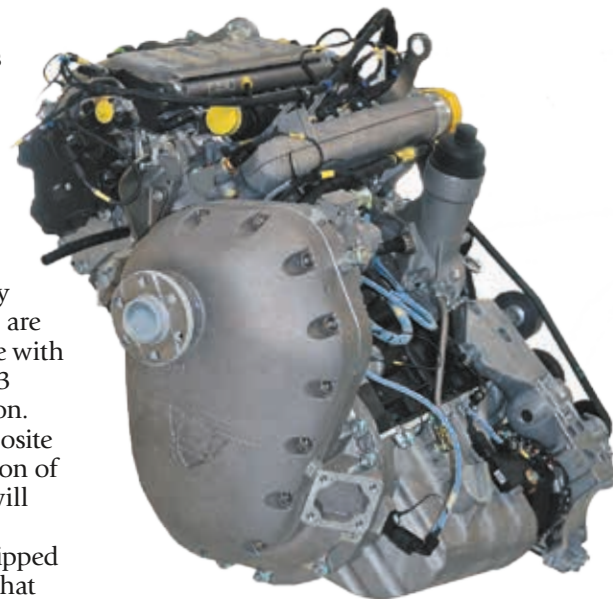
Diamond's Brent Eddington, one of the company's tour pilots and its



sales manager, told us that initial buyers seem to be skipping the rear seat option in favor of more baggage capacity. And can the mid-seat really accommodate three people? Yes, but not three wide people or should we say largish people better be warm friends. But for four people aboard, the mid-seat is positively capacious by any standards.

So are the cabin appointments and comforts. The airplane has air conditioning as an option (\$34,686) and we appreciated that on a warm Florida day. The seats are richly appointed in leather and at every turn, the detailing, fit and finish are what you'd expect of an airplane with a typically equipped price of \$1.3 million on a base of \$1.08 million. Diamond isn't new to this composite thing and a white-glove inspection of the paint, door fit and laplines will reveal unblemished perfection.

Inside, the front seats are equipped with a spring-loaded extension that gives enough room to squeeze past the stick, but effortlessly flips down to provide support for the lower legs. The seats don't adjust longitudinally, but the rudder pedals do—electrically with a small button on the lower left side of the panel. You want cup holders? Of course you do and Diamond has integrated those, plus water bottle holders on the cabin forward sidewalls. Thankfully, Diamond



*With three massive doors, the DA62 is all about ease of ingress and egress. Front seats have spring-loaded, foldable extensions, top photo. The AE 330, bottom, is the most refined and powerful Austro engine yet. It features auto-feathering props.*



*The Garmin G1000 suite, left, includes a GFC 700 autopilot with envelope protection, top. Rudder pedals, center, are electrically adjustable and yes, that's a water bottle holder. VGs, bottom photo, keep flow attached and allow good roll control through the stall.*



Furthermore, in the DA62, Diamond has redesigned the engine start/check switches to be more consistent with the airplane's high price. The demo airplane had TKS de-icing (\$89,485) with the control panel for that located above the engine switches.

As does every Diamond airplane, the DA62 has center sticks and we're unapologetic in saying these

are superior to side sticks or side controllers or whatever you want to call a control that isn't where it should be. The human anatomy is such that with a side controller, movement to the left is weaker than movement to the right or toward the body. A center stick has no such limitations, thus finer control input is possible without fatigue. The tradeoff is that the stick gets in the way during ingress and could be an encumbrance in a crash. Overall, we think the tradeoff is worth it.

Diamond has the throttles readily to hand on a center console, with rudder trim at the top of the stack, along with the parking brake and cabin heat controls. The fuel controls—on, off, crossfeed—live at the aft-most end of the console. There's also a big honking manual trim wheel on the console right where you want it.

We're all for electric trim and all, but increasingly, as a weight-saving measure, airplanes have electric trim as the *only* option. But manual trim is both faster and more precise. It's nice to have the option of both. Jacks for the headsets are also at the back of the console, under an armrest that pivots



*didn't* use the sidewalls as a place to mount circuit breakers you can't get to. Instead, they're mounted on the right-side panel in place of a third Garmin screen that you don't really need anyway.

The panel has come a long way from the first DA42. For one thing, it's wider, so there's more room to spread things out rationally. The early DA42 had engine monitoring instruments that we would generously describe as retro—start-of-the-art digital. In the DA62, and in all of the Austro-engined twins, engine monitoring is integrated into the G1000.

out of the way to provide access.

Here a word about the engines. They are the latest iteration of the Austro 300 series, the AE 330. By tweaking the EECU—no mechanical changes—Austro is wringing 180 HP out of these 2.0-liter, four-cylinder powerplants based originally on the Mercedes Benz OM640, an engine the carmaker has manufactured by the millions. In the AE 330 form, the engine is turbocharged with a common-rail injection system, electronic injection and a single-lever power control with auto-feather capability.

As do the Thielert/Continental diesel engines, the AE 330s have reduction gearboxes, but unlike the Continental models, the Austro gearboxes don't require interim overhauls. They go the length of TBO and here a shortcoming: The TBO is currently 1000 hours, rather short for an airplane costing this much. Diamond pledges to increase this as regulators review the operating data, but worth noting is that none of the diesels currently flying in volume have the 2000- or 2400-hour TBOs that Lycoming and Continental gasoline engines do. Austro engines, by the way, are overhauled, not replaced as are the Continental diesels. Taking the sting off the stingy TBO is a reasonable overhaul price of about \$25,000.

## FLIGHT TRIAL

Like previous Diamond twins, the DA62 is complex electrically, but simple mechanically. The electronic complexity is mostly opaque to the pilot and involves integration of the engines with the avionics. Other than the engines, mechanically, the airplane is manual operation. The flaps are electric and the gear is electromechanical, with a power pack in the nose compartment. The fuel system is simple. The left side feeds the left, the right side the right and

## THE AUSTRO IDEA AT A GLANCE

On a visit to the Austro engine factory in Weiner Neustadt, Austria four years ago, Christian Dries placed his hand on the valve cover of an AE 300 engine and stated flatly: "Mercedes Benz; you can't do any better than this."

It was a not-so-veiled barb hurled at his main competitor, the then-Thielert Aircraft Engine company that has since been bought by Continental. Although both the Continental and Austro engines share the same industrial DNA, Austro's approach is very different than that pursued by Thielert for the development of what became the Centurion diesel and now the CD 135/155.

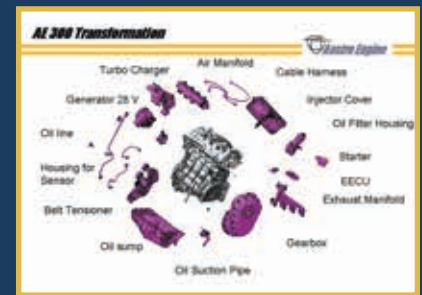
The original Thielert engine was based on the Mercedes Benz OM668, a state-of-the-art turbocharged four-cylinder engine. But Thielert made

substantial changes to the engine, including lightening it with an aluminum block, changes in the cylinder head, a clutch-equipped gearbox and a redesigned ECU.

Austro followed an entirely different path. Although the OM640 it uses as the base engine is similar, Austro retains the core Mercedes engine and adds its own accessories. In fact, fully assembled OM640s are shipped from a Mercedes engine plant to Austro where the automotive parts are stripped off and—gulp—crushed. Austro then bolts on its aviation-specific components, including a gearbox, torsional damper, turbocharger, harness, EECU and a different oil sump.

Because it retains the original cast-iron core, the AE 300 engines are heavier than the Continental models:

408 pounds versus 245 pounds. But in exchange for that structure, Austro teases more power out of the engines and they can be overhauled rather than replaced, as is required with the Continental engines. Furthermore, the Austro engines don't have the 600-hour gearbox replacement required of the Continental engines. Dries maintains this results in lower overall operating costs and less maintenance downtime.



crossfeed is available. Total capacity is 86 gallons, with 50 gallons in two 25-gallon mains and 36 gallons in two 18-gallon nacelle auxiliaries. In our view, Diamond leads the industry in protecting fuel against post-crash impact. The fuel resides in aluminum cells connected by armored lines and protected between two heavy spar elements. As a result, Diamond's incidence of post-crash fire—even in the gasoline models—is among the lowest in the industry.

Because of its simplicity to the pilot, the preflight checklist is short for an airplane of this class. Engine start involves flipping on the engine masters and pushing one of the silver start buttons. This is a bit unnerving. The engines are so quiet and so smooth, it's not easy to tell when they're running and when they're not. The Austros are, by far, the smoothest engines we've encountered.

Runup is automated. Each engine has a dual-channel electronic engine control unit (EECU) with switches on the panel to verify each channel. A pair of momentary buttons held for about 30 seconds will run full checks on the engines, automatically

increasing the RPM when necessary to check the feathering and ECU performance. Once the engines return to idle, the buttons are released and the runup is done. If there are no faults on the G1000, the airplane is ready to fly.

But first, you have to taxi it. Here, another minor ding. The nosewheel bears a lot of weight and we found the pedals to be unpleasantly stiff, demanding stabs of brake where we otherwise might not want it. But there's a workaround and a good one. The engines are throttle by wire and the power levers are silky smooth. That makes steering with asymmetrical power the best way to drive the DA62 around on the ground. It's actually kind of fun.

Takeoff rotation comes at 75 knots after good but not stunning acceleration. The airplane gathers itself a bit and after gear retraction, it settles into an easy 1200 to 1500 FPM rate. Advertised is 1650 FPM, but the nose—which is quite long as should be evident in the photos—obscures the forward view at that rate.

Diamond airplanes are noted for their balanced, no-surprises

handling and the DA62 continues that tradition. Like most light twins, the airplane has some inertia in roll initiation and on final approach, you can feel a hint of PIO if you don't anticipate it. When disturbed in pitch, it barely has a phugoid at all, recovering to the trimmed airspeed in a cycle and a half. Disturb it a lot and the autopilot's envelope protection kicks in. That's true of roll limits, too.

Stalls are rather startling for a twin in that holding the stick full aft provokes no break, wobble or yaw, but a buffeting parachute mode that takes little effort to maintain in a stable state. We didn't attempt to aggravate or provoke it into a spin. VGs on the wings ahead of the ailerons keep the flow stuck to the wing, making roll control possible into the buffet.

When we flew the test aircraft three years ago, it was an honest 200-knot airplane and the finished DA62 retains that performance. The POH gives max cruise at 201 knots at 14,000 feet, but the reality is a more sedate 175 to 180 knots on about 7.1 to 7.5 per side. With full fuel, that translates to five hours of endurance, with a 45-minute reserve and a still-air range of 875 miles. Back the engines down to 60 percent power

*continued on page 32*



# Budget Fuel Totalizers: Insight, Shadin Tops

*We favor Insight's TrueFlow500 sensor for primary GPS interface and the Shadin Flo series for its various mounting options.*

by Larry Anglisano

**A**mong the many avionics gadgets to install, an aftermarket fuel totalizer could offer the most utility. These devices are simple to operate, they work with most modern GPS navigators for trip endurance calculations, and while installation technique is critical, they aren't overly complex to retrofit.

There are four major players in the standalone fuel computer market: Shadin Avionics, Insight Avionics, JPI Instruments and Electronics International. In this article we'll look at each product line and show how they can interface with a GPS navigator.

## FUEL FLOW METERING 101




A misconception is that fuel totalizers measure fuel quantity. While that may ultimately be the end result (you first have to enter the amount of fuel that is in the tanks), a

fuel totalizer meters the amount of fuel that flows to the engine. Think in terms of fuel endurance (based on flow) rather than fuel quantity. Fuel metering is done with a fuel flow transducer installed in line and prior to the fuel distributor or carburetor. The fuel passes through a small axial turbine wheel and past an optical sensor located inside the transducer body, which spins faster at higher fuel flows and slower at lower ones. A higher capacity transducer may be required for larger engines, including turbines and radials.

A fuel flow transducer is an electromechanical device, since it converts the energy of the spinning turbine wheel to electronic signal pulses, which are passed along to a microprocessor and then displayed on a control head or on a GPS navigator (generally on a fuel endurance utility page).

The transducer is

## CHECKLIST

-  Shadin Flo series have rugged controls and proven reliability.
-  GPS navigator integration takes fuel endurance planning to a higher level.
-  The money might be better spent on an engine monitor with integrated fuel flow.

a critical component in the fuel system, and the installation requires splicing into the engine fuel supply line. For this reason, we caution against installations done on the cheap. We've seen far too many compromised installations, including ones with shoddy signal wiring, improper clamping, missing fire sleeving (this is a protective sheathing installed around critical components in the fuel delivery lines), and even leaking fuel line fittings. This is the stuff that engine fires are made of.

The good news is that fuel transducers are designed to be failsafe, and a failed metering turbine will not interrupt fuel flow to the engine. Last, to get the correct measure-

*Fuel data should be easy to read at a glance. Shadin's 3-inch Digiflo, lower left, and JPI's 2-inch FS450 do just that with their bright LED displays.*



# REMOTE FUEL FLOW ADAPTERS



There are advantages and disadvantages to remote fuel flow adapters, including Shadin's RemoteFlo, shown at the lower right, and Insight's TrueFlow500, upper left. They'll save panel real estate because they provide fuel data over a digital databus that's linked to a GPS navigator, like shown on the Avidyne IFD540 screen shot above. The downside is you won't always have at-a-glance fuel data unless you're turned to the navigator's fuel utility page. The Insight TrueFlow500 has a transducer packaged with a microprocessor, while the Shadin requires its own transducer.



ments, the system has to be properly programmed. This includes setting the device's K factor—a numerical value representing the number of electronic pulses generated per gallon of metered fuel flow. The science to accurate fuel computer installations includes fine-tuning the K factor and accurately entering the total usable fuel during the initial programming. When soliciting quotes for installation, ask the shop how many systems it has installed and on which engines. Since the job will require both engine and avionics work, you want a shop possessing both skills.

If you already have a fuel computer and are upgrading the GPS, listen up. Rapidly changing navigator software could have a sizable effect on its compatibility. We've heard from some owners whose shops had to backload software to regain full capability. Installations can be a real test of cross-brand compatibility and you'll need to rely on the shop to know what is compatible.

## SHADIN FLO SERIES

When it comes to form factor, Shadin's Flo-series computers are the most versatile on the market. The line

comes in a variety of shapes and sizes and all of the systems have a GPS interface, via two-way RS-232 serial data. This is what the L suffix is after the models, left over from the Loran-C days.

On a side note, if you're searching the used market for a used Shadin fuel computer, earlier models only support a one-way data stream (they can't receive GPS data), while some didn't have the capability at all. You'll also need the right transducer, which depends on the design of the fuel system. Most shops will require that you purchase a new installation kit, perhaps even a new transducer. A new Shadin/Floscan transducer kit sells for nearly \$900.

The current Shadin product line includes the Microflo-L, which fits in a 2-inch instrument hole, the rectangular Miniflo-L and the Digiflo-L, a full 3-inch instrument available for both single- and twin-engine applications. Regardless of the model, we've always been impressed with the Flo series' rugged bezel controls and bright LED displays. The computers can be configured to display fuel in gallons per hour (measured to a tenth of gallon, up to 100 gallons) or in pounds.

All of the Flo-series control heads offer the same basic functions. In single-engine applications, the current fuel flow is always displayed in one window (the Digiflo-L for twins has a dedicated flow window for each engine), while fuel remaining is shown in another window. You can also view the amount of fuel used and fuel remaining by pressing the REM/USED toggle switch. A rotary switch enables the display of fuel endurance (in hours and minutes), nautical miles per gallon, gallons to destination and gallons to reserve. Many of these functions rely on a connected GPS navigator source for groundspeed.

As mentioned in the above sidebar, a new product is the Shadin AIS-380 RemoteFlo. Communicating via Arinc 429 or RS-232 to a wide variety of GPS navigators and remote displays (including Garmin, Avidyne and BendixKing), the RemoteFlo measures 6.90 by 4.24 by 1.57 inches and weighs less than one pound.

It can be mounted in any orientation in the aircraft, although it has to



*The Electronics International FP-5L, left, can serve double duty as a fuel pressure indicator or display one of many engine sensors. Shadin's rectangular Miniflo-L, right, is an alternative to the company's round fuel computers.*

be located within a controlled temperature area and inside the pressure vessel in pressurized aircraft. The device also has an air data computer input, in addition to magnetic heading input for outputting to compatible devices. Shadin's Flo-series computers start at \$1100 for singles.

### JP INSTRUMENTS

Previously acknowledged with an *Aviation Consumer* editor's choice award, the JP Instruments Fuel Scan 450 (FS-450) mounts in a 2-inch instrument cutout and has a seven-segment LED display. What we like best about that photocell-controlled display is it always shows the current fuel flow on the top line, while it

scrolls through other parameters on the lower portion, including total fuel used and the amount of fuel that's remaining. It's configurable to measure in gallons, pounds or liters.

By default, the FS-450 automatically loop-indexes through five parameters, including the amount of fuel used since the last refueling, the amount of fuel remaining, endurance (the hours and minutes of remaining available fuel), the fuel required to the next active GPS waypoint and the reserve fuel that will be remaining when you reach the next active waypoint. The Step button allows you to manually freeze the display on any of these parameters, while individual annunciator lamps indicate which one is being displayed. Pressing the Auto button puts the unit back into scan mode.

We think the FS-450 has an easy yet interactive user interface. For instance, if there is a low fuel or an endurance alarm, the automatic scanning will stop and the appropriate mode's indicator lamp flashes to acknowledge the alarm. Press the Step button to acknowledge, and the



scan resumes. The FS-450 is compatible with a wide variety of newer and vintage GPS navigators through its serial databus. It can also be connected to compatible portable GPS systems.

The FS-450 comes in several versions, including one for Rotax engines. The FS-450P for fuel pump-equipped engines (and the FS-450G for gravity flow fuel systems) is \$699. Interfaces with pressure carburetors require two transducers, increasing the system price to \$1095. There is also a version with a high-flow transducer for \$1380. If you already have a transducer on the engine, you can purchase the FS-450 indicator and an interface harness for \$400.

### ELECTRONICS INTERNATIONAL

In addition to computing fuel flow and endurance data, the company's 2-inch LCD display-equipped FP-5L (and FP-5 without GPS interface) fuel totalizer is approved for use as a primary fuel pressure indicator, since it's equipped with an additional data input channel.

That same channel can alternatively be used for displaying either EGT (which provides compensation for a displayed horsepower value during engine leaning), CHT, oil temperature, carb temperature, OAT, oil pressure, manifold pressure, instrument vacuum, bus voltage or amps. The instrument requires an optional Functional Module, which is a 3- by 2- by 1-inch remote processor. It comes with the proper sensors and cables. You could connect multiple sources to the one channel and toggle through them with a remote control switch, but we think a full-up engine monitor is the better choice for the required effort.

As for fuel monitoring, Electronics International manufactures its own fuel flow transducer, a device that EI says tames the displayed fluctuations in flow during changes in mixture settings. We like the automatic calibration mode, which fine-tunes the K factor if you find inaccurate calcula-

### BUDGET FUEL COMPUTERS COMPARED

MODEL	BASIC PRICE	MOUNTING	COMMENTS
EI FP-5(L)	\$748	2-inch instrument	Has an auxiliary channel for primary fuel pressure.
INSIGHT TRUEFLOW500	\$728	engine	Combination transducer/processor reduces the installation effort.
JP INSTRUMENTS FS-450	\$699	2-inch instrument	Bright, dual-parameter display, intuitive feature set.
SHADIN MINIFLO-L	\$1189	rectangular	Rugged bezel controls, versatile mounting.
SHADIN MICROFLO-L	\$1089	2-inch instrument	Bright display, same functions as Miniflo-L.
SHADIN DIGIFLO-L	\$1729	3-inch instrument	For twin-engine applications, simultaneously displays current fuel flow for left and right engines.
SHADIN REMOTEFLO	\$2500	remote	Two-piece system (including transducer) for interface with GPS navigators.

## Practicalities

# FUEL PLANNING FOR DUMMIES

Through third-party software, even entry-level totalizers can do a lot for real-world fuel planning. That's because integrating one with a modern GPS navigator can add serious and simplified trip planning, including the fool proof graphical display of endurance directly on the moving map. No more flipping to a fuel planning utility page on the navigator to know when you better start looking for gas.

Garmin's onscreen Fuel Range Ring feature is present on the G1000 integrated avionics and it's now standard on the company's aftermarket GTN750 and GTN650 navigators. That's a graphic below. The function requires GTN software version 6.00 or later. When enabled, the Fuel Range Ring shows an estimate of the remaining flight distance at the current fuel consumption rate and groundspeed. The data is derived by fuel quantity input or from a fuel flow computer. Garmin's GTN installation manual specifically recognizes Shadin's new AIS-380 RemoteFlo and the rest of the vintage Flo series models, with some exceptions. That doesn't mean other sensors won't work, but maintaining current operating software and programming it for the proper RS-232 data label is a must, Insight Avionics said when asked if its TrueFlow500 sensor will work with a new GTN750/650.



Avidyne's IFD540/440 navigators also have low fuel protection (which was standard since the IFD's inception), shown above. The map displays a green fuel range ring indicating a fuel reserve of 45 minutes. A dashed green circle indicates a maximum range without reserve. Avidyne's current installation manual recognizes Shadin, JP Instruments, Electronics International, Insight and existing ARNAV FC10 computers as being compatible in the interface.

Both Avidyne and Garmin navigators have dedicated fuel planning pages and you don't even need an onboard fuel computer to make use of them. Without one, you'll just have to enter the fuel flow data on your own—that's more work.

tions of fuel remaining or fuel used since you filled the tanks.

It's worth noting that transducers used by Shadin and JPI are manufactured by Floscan. These have proven reliability, with metering accuracy, according to Floscan, within one-tenth of a gallon at a given fuel flow.

The FP-5 and FP-5L each have seven display modes: fuel flow, horsepower, fuel remaining, fuel used since full, fuel used for the flight, time-to-empty, plus the aux channel. The GPS-compatible FP-5L has all the features of the FP-5, with four additional display modes: nautical miles per gallon, statute miles per gallon, fuel to the destination and fuel reserve. The bezel controls are straightforward, with dedicated fuel-to-destination and fuel reserve toggle switches, plus a Step toggle switch for moving through the onscreen data.

The FP-5 has pilot-programmable alarms that will flash the red low fuel warning LED, providing first and second-time alerts. Low fuel and high/low fuel pressure annunciators are placed at the top of the bezel, directly above the main display. You can adjust the intensity of both the indicator lights and the LCD backlighting.

The standard FP-5 system with transducer is \$748 and the FP-5L is \$778. You'll need the \$395 FFDM-1

fuel flow differential module for installation with a pressure carburetor.

## HOW YOU MIGHT CHOOSE

With big-screen fuel data integration, we wonder about the longevity of a dedicated fuel computer control head. The first step is to price an engine monitoring system. We'll cover them in the next issue of *Aviation Consumer*, but consider that JPI's entry-level EDM700 with integrated fuel computer might be installed for under \$5000. While that number is higher than a basic standalone fuel computer installation, there is installation savings when installing fuel and engine data at the same time.

For the cleanest install and if you can live without a control head, we like Insight's TrueFlow500 transducer/computer combo. For generous mounting options, the Shadin Flo series wins. In the end we don't think there is a wrong choice for selecting any model we cover here. Choose one based on display preference and the available panel space.

## CONTACTS...

Electronics International  
541-318-6060  
[www.buy-ei.com](http://www.buy-ei.com)

Insight Avionics  
905-871-0733  
[www.insightavionics.com](http://www.insightavionics.com)

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

Shadin Avionics  
800-328-0584  
[www.shadin.com](http://www.shadin.com)

# Building a Hangar: Shelter, Not Investment

*We like the availability and quality of pre-engineered hangars, but caution against building on a public-use airport. Don't bank on a money-making resale.*

by Rick Durden

The stars have aligned just right—your local airport has a waiting list for hangar space, you are unwilling to park your airplane at a tie-down and the airport has land it will lease at a reasonable rate. This is your chance to create a hangar that will suit your airplane—and potentially your need to spend quality time with your airplane.

As we got into our hangar research we were amazed at the number of companies that sell pre-engineered hangars, many offering turnkey erection. Almost all are metal building manufacturers that build hangars as one of their clear-span products. Most will work with you to match the demands of your site and help you with what may be a complex approval process for construction on a public-use airport.

## EARLY CONSIDERATIONS

Especially on public-use airports, we recommend that you do extensive homework regarding the airport's

friendliness to privately owned hangars. That starts with the airport's Minimum Standards and its rules and regulations concerning hangars. We also suggest that you spend a lot of time talking with other owners of private hangars to find out about their experience in dealing with airport management.

On a private and/or residential airport, unless you are going to be the sole tenant, we recommend that you get to know other hangar owners, plus review any restrictive covenants and airport rules to get a feel for the atmosphere of the airport. We have seen big egos make life on little airports miserable for hangar tenants who don't fit the mold.

We can't emphasize enough the importance of making sure that you will be able to work with airport management—otherwise what starts out as a reasonably priced way to get into a hangar can turn into an expensive mess. We were recently apprised of the nightmare experienced by an

aircraft owner who wished to erect a hangar on a state-owned airport. It took three years to negotiate the lease for the land under the hangar because the airport management company kept changing the terms and adding new conditions to the proposed lease.

Whether you are planning to build a personal hangar or a row of T-hangars to rent out as an investment, the first step is to sit down with airport management, outline what you intend to do and find out precisely what land is available, the cost per square foot to lease the land, the length of a lease the airport is willing to grant and what will be involved in obtaining taxiway access—plan on paying to pave any needed taxiway(s) and ramp(s) in front of the hangar(s).

## LAND LEASE

In our informal survey we found that airports generally offer 25-year land leases, with one option to renew for a second lease period. We saw one that only offered a five-year, renewable land lease. We were told of a hangar owner at that airport who got sideways with the powers that be and was out on his ear when his lease was not renewed—ownership of the hangar reverted to the airport.

At the end of the lease, it's not uncommon for ownership of the hangar to revert to the airport.

A lease shorter than 25 years may make it tough to get a loan to build a hangar of significant value. It makes the economics of amortizing an investment that will be worth zero at the end of the lease term less than attractive.

The lease should contain protections for you in that the airport should not be able to step in and take your hangar away from you for minor violations of airport rules or being a day late with a lease payment. In our opinion, the lease should require that the airport take steps akin to a bank foreclosing on a house for failure to pay for a mortgage. Airport politics can get weird, so it's necessary to be able to protect yourself should someone with a lot of political clout and who wants your hangar start putting

*Clear span, steel, box hangar with electric bi-fold door from Rhino Steel building systems.*



pressure on the airport manager to take it away from you.

## MINIMUM STANDARDS

Look carefully at the airport Minimum Standards (most public-use airports have them). They often have detailed hangar requirements, including minimum and maximum sizes as well as, believe it or not, exterior color. Unreasonable Minimum Standards are a warning flag that the airport management will not be easy to work with.

Airport rules and regulations may affect hangar usage. We've seen some awful ones, such as the hangar door can only be open long enough to move an airplane in or out, no refrigerators or couches in the hangar and no parking a car in the hangar when the airplane is out flying. If you're going to spend \$50,000 to put up a hangar, you don't want to be hamstrung in your enjoyment of it by petty rules established and enforced by unreasonable airport management.

Review the Airport Layout Plan (ALP). It shows existing facilities and projects usage of the airport into the future. Your proposed hangar may not fit with the ALP if the location you'd like is right where the airport intends to build another runway in 10 years.

## UTILITIES

You may or may not be able to bring utilities to the hangar—if you can, find out what it is going to cost and if the airport has any rules relating to routing. We've seen airport rules regarding routing and burying electrical utility wires that made installation cost prohibitive.

Those who have built hangars told us that if you can bring water and sewer into the hangar, do so. Even if you can't afford to put in a bathroom right away, the value add in doing so at some point will enhance the resale value of the hangar.

What are the taxes you will face in erecting and owning the hangar? Those can vary widely state by state and by locality.

There will probably be zoning regulations to comply with as well as a local permitting and inspection process that will have its own set of fees.

Does the site drain adequately?



Historically, airports have been built on the cheapest land available to the entity developing the airport. It's not unusual for that land to have been cheap because it has crummy drainage. Building a hangar that turns out to flood easily is a mistake you don't want to make.

Will the construction need FAA approval? On most public-use airports, you'll need to file a Form 7460-1 with the FAA 45 days prior to construction. The FAA is concerned with structures that could project into protected airspace around runways or may block the view of portions of aircraft movement areas from the control tower. For most hangar construction, the requirement is a formality, although we have seen a few instances where the design of a proposed building had to be modified.

## THE STRUCTURE

Whether you are building a single T-hangar, box hangar or a series of either or both, you'll need to decide on the basic structure. The most common is post-and-beam. You can still find Quonset/Nissen hut han-

*Quonset-style steel hangar from U.S. Buildings with outrigger sliding doors, top. Flexibility in hangar design demonstrated in a Shengbang Steel Structure Company pre-engineered hangar, above.*

gars. They are strong and inexpensive although, because they slope inward, take more square footage for the same aircraft storage area. The lower price may be offset by the cost of the land underneath. There are also durable fabric hangars on the market; however, we tend to think of them as temporary rather than permanent.

The post-and-beam structures are broken down to an open-webbed truss with straight columns and a rigid frame. The rigid frame uses tapered frame sidewalls (wider at the top than bottom) and rafters. The open-webbed truss uses straight sidewall columns that are much thinner than the tapered frame sidewalls and truss rafters. The open-webbed

## SUMMIT S-1 SAFE-T-HANGAR: PORTABLE

For the owner who wants a strong, no-frills hangar to protect his airplane and is handy with tools, the Summit S-1 Safe-T-Hangar may fit the bill. Summit Metal Systems ([www.summit-metal.com](http://www.summit-metal.com)) advertises its S-1 by simply saying that if you've got ramp space, it's got a hangar for you.

For about \$19,000, before shipping, Summit will put together what amounts to a sophisticated Erector Set that you put together on your ramp space. Although it's designed for installation on concrete or asphalt, a hard surface is not absolutely required—just a way to anchor the structure to withstand wind loads expected for the area.

To give an idea of the strength and ability to handle snow loads, Summit's website shows an S-1 hangar with a pickup truck parked on top of it. We're not sure how they got it there, but it was an effective demonstration.

According to Summit's Mark Lutman, most pilots have the necessary mechanical ability to put an S-1 together, as the company has tried to make them as user-friendly as possible. Summit personnel are ready to field questions that may develop as a first-time hangar assembler works her way through the process.

The hangar is 41 feet, 6 inches wide and 33 feet deep. It consists of a 20-foot-wide center section that has a door clearance of 10 feet, 10 inches and two shorter wing sections with doors that are 10 feet, 10 inches wide. The photos below are of an earlier version of the hangar,

but give an idea of the size of the S-1. The aircraft in the hangar is a Cherokee Turbo Arrow—as can be seen, there is plenty of room for the airplane and guests at a cookout.

The hangar itself is a steel frame with sheet metal sheathing. The side doors slide open against the inside ends of the hangar while the one-piece center door lifts up much like a one-piece garage door with a spring-assist.

We were told that owners have installed electric garage door openers on the center door, but our experience has been that so long as it gets a modicum of maintenance and lubrication, the forces involved with opening and closing are reasonable. Lutman told us that Summit does not recommend installing garage door openers.

Summit advertises that it will work with prospective buyers with site planning and erection of the hangar. Having been in business for some 20 years, it has significant experience with airport leases, subleasing and renting for those who wish to assemble several of the hangars to rent or lease to aircraft owners and will work with buyers on addressing those issues.

Summit advertises the S-1 as a portable hangar. While portable means disassembly rather than picking it up and moving it, we agree with the term. We are aware of circumstances in which the ability to disassemble and move a hangar saved the hangar owner a great deal of money. While rare, if you feel the need to own a portable hangar, the S-1 should fit the bill.

truss has a substantially smaller wall width, giving more space inside the hangar and allowing a larger door for a given overall hangar footprint.

### DOORS

Doors make the hangar. There are three main styles in ascending cost: sliding, electric bi-fold and one-piece hydraulic lift.

Sliding doors either have rollers on the top and are routed by a series of metal guides on the floor, or have rollers on the bottom on an embedded track and door guides at the top of the opening. We have spent hours trying to open or close sliding doors in snow country.

We once watched an owner try to open his sliding hangar door by pushing it with the front bumper of his car. He damaged the door and bumper—and didn't get the door open. We blew a tire on our car by driving over a floor-mounted door guide at the wrong angle.

Sliding doors require a good foundation as the freeze-thaw cycle and heaving of the ground often causes them to bind.

We've also seen poorly designed hangar systems in which opening the sliding doors of one hangar covered the door to the next hangar, effectively blocking it. Finally, we recommend against outrigger-type sliding doors (previous page) in snow country.

The electric bi-fold hangar door leaves sliders in the dust when it comes to convenience. Even though the door is more expensive than sliders, it does not require the foundation work of a sliding door. Of course, it's necessary to have electricity available, so an inability to run utilities to the hangar may preclude an electric door unless a generator is available.

Electric bi-fold doors are attached either to the header system of the hangar, door truss or door frame. When closed it latches to the vertical door columns—either automatically or manually. Because an open bi-fold door forms a wedge that subtracts three feet from the vertical portion of the door opening, it may require building a taller hangar than needed for other doors.

Considerations when picking an electric bi-fold door include whether the company that makes the hangar also makes the door—which simplifies construction and warranty work;



the location of the motor, gear box and drive system—we've seen some that were stupidly located where they partially blocked access through the human door; the location of the control panel (we don't want to walk across the hangar to turn on the lights); safety factors in the door system and safety factors built into the lift cables or straps—they will eventually fray.

Make sure you see one of the doors installed before you buy it: We've seen some poor bi-fold installations that looked good on paper. In one, when the wind was blowing against the door, it was necessary for the operator to push the door outward against the wind with all his strength before hitting the door open button. Otherwise, the system wasn't strong enough to start the door moving against the wind and the circuit breaker would pop. The circuit breaker was located just below the ceiling of the hangar, necessitating climbing a tall ladder and using a stick to reset the breaker.

## HYDRAULIC DOORS

We found two major suppliers of single-piece, hydraulic doors: Schweiss (which also makes bi-fold doors—[www.bifold.com](http://www.bifold.com)) and Higher Power Doors ([www.hpdoors.com](http://www.hpdoors.com)). While more expensive than a bi-fold door, they allow a shorter door opening because they do not create the wedge of a bi-fold door when open.

We like that the Higher Power door mounts in its own support frame, eliminating the need for a truss or header to support it on the hangar itself.

An open hydraulic door provides a large shaded area in front of the hangar; however, as it sweeps forward while opening, it requires that the airplane be parked farther from the hangar when the door is operated than with other types of doors. It also may require removing a significant amount of snow before operating.

While researching this article, we looked at hangar rental prices, only to find that they vary wildly by location—the busier the airport, the more expensive—the type of door installed and availability of electricity. We saw monthly rates for T-hangars from a low of \$150 to a high of \$750. We did not find many box hangars for rent.

We explored the cost of construct-



ing a 40-foot x 40-foot box hangar and got prices for a pre-engineered structure with a bi-fold door starting at \$28,000 for the Summit S-2 hangar—a larger, more sophisticated version of the Summit S-1 described in the sidebar on page 18. It is designed to be erected by the buyer. The price does not include the concrete floor, footings, electrical connections or any other desired add-ons.

Overall, we think \$40,000 represents the base price of a turnkey 40 x 40 box hangar with bi-fold door.

When looking at building a group of hangars, we like companies that specialize in pre-engineered hangars and have been around for several decades such as Summit and Erect-A-Tube ([www.erect-a-tube.com](http://www.erect-a-tube.com)). We note that Erect-A-Tube was a pioneer in developing the bi-fold door. Nevertheless, after following the construction of two large box hangars over the last few years, we have been impressed with the ability and competency of the companies that offer pre-engineered hangars as one of their metal building product lines.

## A SUCCESSFUL EXAMPLE

One of the two hangar projects we followed was in Cadillac, Michigan, where Northwoods Aviation replaced



*The hydraulic door from Higher Power Doors lifts up and slightly inward so it only subtracts eight inches from the height of the door opening, top. Not all hangar doors get mounted on hangars—the single-piece, hydraulic door from Schweiss is designed to minimize space lost from the door opening, above.*

its hangar, which had originally been built by the WPA in the 1930s, with an 80-foot x 60-foot pre-engineered hangar from Wick Building ([www.wickbuildings.com](http://www.wickbuildings.com)). It included a 50-foot-long Schweiss bi-fold door.

Wick sent an engineer to Cadillac to coordinate soil analysis, site survey and evaluation of heating needs for the hangar. That resulted in engineering drawings that were easily accepted by the airport authority.

Because door height was vitally

## BEFORE BUILDING CHECKLIST

Your research into building a hangar should include getting answers to at least the following questions, many of which are outlined on Erect-A-Tube's website:

- What are the Airport Minimum Standards regarding hangar construction?
- What are the construction, permitting and inspection standards for all political entities with jurisdiction over the hangar?
- Will the hangar impinge on runway protected airspace or ATC control tower sightlines?
- What are the land lease terms?
- Will hangar ownership revert at the end of a lease?
- What are the exact site dimensions?
- What are the exact building dimensions?
- Are detailed engineering drawings included in the price? They may be required for permitting.
- How much wing and tail clearance do you need inside the hangar—vertically and horizontally?
- Is the eave the correct height to provide proper clearance for the hangar door?
- How much available opening height is lost to the door when it is in the open position—is there still adequate tail clearance?
- Whose hangar door is supplied by the building manufacturer?
- Who is responsible if the build-

ing and door do not align properly?

- How is the door being supported and is the building properly engineered for that method of support?
- Where is the hangar door operating control mounted?
- Is there a remote control for operating the hangar door?
- Is there a human door through the hangar door? If so, what are the specifications and where is the door operating mechanism in relation to the human door? Is it a trip hazard in the dark?
- What structural components are used in fabricating the hangar door?
- How many wall girts and partition girts are included in the building price?
- Are main frame uprights on 20- or 25-foot centers?
- How much roof overhang is needed to protect against drips when using the human door(s)?
- What is the tensile strength of the exterior wall and roof sheeting?
- How many anchor bolts are used with each column?
- What is the warranty on the exterior sheeting?
- What is the paint warranty?
- Can the structure stand alone without the need of diaphragm action from the exterior sheets?
- How will the site drain?
- Will foundation drains be needed?

important—the hangar would handle airplanes on amphibious floats—Northwoods owner Derek DeRuiter specified that the hangar be engineered to allow the bi-fold door to be mounted high on the door truss so the bottom of the door in the open position matched the top of the door frame.

A team of builders contracted through Wick erected the hangar. We visited periodically during construction and spoke with DeRuiter a number of times. He did not express any complaints with the process to us. With in-floor heat, a ceiling crane for lifting airplanes off and on floats, insulation for the north woods and a number of options for his specialized business, the finished cost was well north of \$200,000. Coming out of the first year of operation and a Michigan winter, DeRuiter told us that he has been very satisfied with the result.

### CONCLUSION

We recommend caution going into construction of a hangar on a public-use airport and constantly keeping an eye on your personal cost-benefit ratio during the design phase. We do not recommend considering the hangar as an investment other than in protecting your airplane and providing a comfortable place to spend time while at the airport. As general aviation continues to struggle, we are not optimistic on hangar resale value.

Nevertheless, as a result of our research and following the construction of two hangars, we are optimistic about the quality of pre-engineered buildings and doors available. If building a hangar is right for you, we think you can find a pre-engineered hangar that fits your needs.

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*Northwoods Aviation in Cadillac, Michigan, frequently handles airplanes on amphibious floats—requiring a tall hangar door. The Schweiss bi-fold door was mounted high on the truss above the door opening. It allowed a full 16 feet of vertical space with the door open. This photo of the door in motion shows how it is mounted.*



# Garmin G5 EFIS: Standalone, Integrated

*Garmin's \$1200 G5 EFIS was designed for LSA and experimentals, but an STC approval could bring stiff competition to Dynon's EFIS-D10A.*

by Larry Anglisano

**W**hile evaluating Garmin's new G5 electronic flight instrument, we couldn't help but look beyond its target market of light sport and experimental aircraft. At first blush, the instrument is packaged perfectly for use as a primary attitude instrument in vintage steam gauge-equipped panels, fitting in the 3-inch attitude instrument cutout.

But Team X, Garmin's engineering team that's tasked with developing products for the LSA and experimental market, had other plans for the G5, designing it as an EFIS to back up—and integrate with—the PFD in its G3X Touch integrated avionics suite. Mention FAA certification to these guys and you'll hear their laughter echo across the state of Kansas.

Team X might walk one of its uncertified G5s down the hall to its certification brethren, because within a week of its introduction, Dynon announced the STC approval for installation of its uncertified EFIS-D10A in certified aircraft. With a starting price of \$1200, we think the G5—or something spun from its concept—could give Dynon a run for its certification dollars and buyers another good option for an affordable EFIS.

## MORE THAN AN ATTITUDE

While the G5 is first and foremost an attitude instrument, it displays far more data than pitch and roll. Think of it as a full-up EFIS with a built-in

air data computer, WAAS GPS, external navigation interface, autopilot control head and a defense against electrical failures with a rechargeable lithium-ion battery. Garmin says the battery (which is optional) can power the G5 for up to four hours.

Aside from its redundant display, it also serves as an instrument source backup to the G3X Touch. During a G3X ADAHRS failure, the G5 supplies the appropriate air data, attitude and heading information to the G3X panel displays.

The instrument, with its 3.4 by 3.6 by 3.6 inch chassis (just 2.1 inches deep without the battery), is dwarfed by Garmin's 10-inch G3X PFD, but the G5's bright LCD display with LED backlighting makes up for its small stature. The 3.5-inch QVGA display (it has a 20- by 240-pixel resolution) is readable from wide viewing angles and our eyeballs would be comfortable looking at it as a primary source of data on a small instrument panel. There is a lot of data packed in a small area.

The G5 can replace all of the traditional six-pack flight instruments—a possible application for LSA and experimentals—or used for backup. There are minimal controls on the bottom of the bezel,

*The G5, main photo, is designed for simplicity, but packs a punch in terms of function and data display. Notice the autopilot annunciation at the bottom of the screen.*

## CHECKLIST



It has a small display, but is crisp, bright and the data is logically presented.



Autopilot and navigation capability offers serious redundancy to a G3X Touch suite.



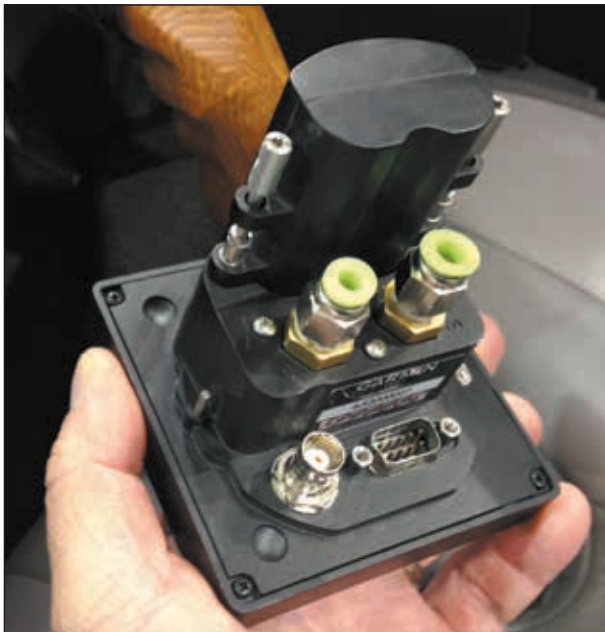
Without an STC, you can't legally install the G5 in a Part 23 aircraft.

including a rotary function knob, an on/off power button (which serves double duty as a display backlight control) and a microSD card slot for software updates.

The G5 has two main pages: the PFD page and the HSI page. When in the PFD mode, the entire left portion of the screen is occupied by an airspeed indicator/rolling number tape with color-coded speed range strips, plus a magenta-colored airspeed trend vector line. The end of the trend vector corresponds to the predicted airspeed in six seconds if the current rate of acceleration is maintained. Like most PFDs, the G5 can be configured to display V-speed markings on the tape. A data block at the bottom of the speed tape displays GPS groundspeed.

Attitude information is displayed over a virtual blue sky and brown ground with a white horizon line,





*Clockwise from lower left: The G5's HSI page displaying bearing and course data from the G3X. The rear chassis has pitot and static ports, a GPS antenna connector and the \$150 backup battery installed. That's a G5 backing up a G3X Touch PFD.*

which is also part of the pitch scale. Pitch markings are spaced at 2.5-degree intervals and a yellow symbolic aircraft corresponds to the current pitch attitude. There is also a dual-cue autopilot command bar presentation when the G5 is interfaced with Garmin's autopilot. More on that in a minute.

A slip/skid indicator is positioned at the bottom of the display, along with a magenta turn rate trend vector. The right side of the display houses the altimeter with a rolling number tape, and a selected altitude bug is in a dedicated box at the top of the altitude tape. A bug corre-

sponding to this altitude is shown on the speed tape. We really like that the selected altitude is synchronized with other displays in a G3X suite over the CAN network—eliminating the need to enter the data twice or more times. The baro setting is also synchronized between displays, or it can be set with the bezel knob on the G5. Pressing and holding the knob syncs the selected altitude to the current altitude. The vertical speed indicator display is a non-moving tape with tick marks every 100 feet, with the current vertical speed displayed using a white arrow along the tape.

The G5 has visual altitude alerting, although we wish it had an audio output. Instead, when passing within 1000 feet of the selected altitude, the bugged altitude flashes for five seconds, and again when passing within 200 feet of the altitude. Blow through the altitude and the selected altitude text changes from white to yellow and then flashes to get your attention.

### NAVIGATION, AUTOPILOT

A heading/ground track tape is displayed at the top of the PFD page and will indicate magnetic heading when a magnetometer is connected over the CAN network, which is synchronized with the G3X. A light blue heading bug is displayed on the heading tape and on

the dedicated HSI page, which is a familiar rotating compass card in a heading-up orientation. To adjust the heading bug, select Heading or Track from the menu and use the control knob to make the change.

A bearing pointer can be displayed on the HSI as a raw nav data source (VOR/localizer) or GPS. Color coding indicates the navigation source in use: magenta (for GPS) or green (for VOR and LOC).

When connected with the G3X and G3X Touch system, the G5 serves as a fully redundant navigation indicator, with instrument approach guidance, although there is no synthetic vision. You might see it in the future.

The ILS VDI (glideslope) is depicted as a green diamond and appears to the left of the altimeter. It also displays GPS vertical course data (differentiated by a green diamond) and is analogous to the glideslope for all types of WAAS GPS approaches, including LNAV+V.

The lateral CDI for GPS/localizer data is positioned at the bottom of the attitude display.

Changing the displayed navigation source (GPS and VOR/localizer) is done directly from the external navigator. Compatible sources include Garmin's GTN750/650, GNS530/430, GNC255 navcomm or SL30

TV G5 EFIS VIDEO

AVweb  
www.avweb.com

# Eye Aligner: A Sight For Flight

*A portable version of the seat height adjustment spheres found in jets helps you dial in the proper view over the glareshield. We think it's worth a try.*

by Larry Anglisano

navcomm. Additionally, when connected with a portable GPS that's outputting NMEA RS-232 data (Garmin aera660/796/795), the G5 can display a VNAV profile. This is a magenta chevron overlaid on a VDI scale positioned to the left of the altimeter. That's a smart utility.

When paired with Garmin's GMC307 and GMC305 autopilot mode controllers and GSA28 servo actuators, the G5 displays autopilot mode annunciation and provides autopilot mode command from the bottom of the PFD display. These modes are displayed in what Garmin calls AFCS (automatic flight control system) status boxes. Mode annunciators include AP, for autopilot active, FD, for flight director active, ROL, for roll mode and ALT, for altitude hold. These are just a few of the annunciators that appear, and most all of the modes that are accessible on the external autopilot mode controller are available on the G5. This includes vertical speed mode, or VS.

In VS mode, the flight director maintains the aircraft's current vertical speed to the nearest 100 FPM. The mode is also used for climbing and descending to a selected altitude, since the selected altitude capture mode is automatically armed when the vertical speed mode is selected. Yes, Garmin's integrated autopilot is a seriously capable system and the G5 EFIS can play an integral role in its operation. It can be configured as a standalone autopilot controller or as a backup system for the G3X, but still requires a GMC307 or GMC305 panel control head.

## WILL IT CROSS OVER?

In our estimation, should Garmin choose to play in the evolving market of uncertified avionics for Part 23 aircraft, its G5 EFIS could be perfect for getting its feet wet. At \$1350 with the backup battery, it seems like a logical competitive product to Dynon's STC-approved EFIS-D10A—a standalone EFIS that's expected to be priced in the \$2000 range.

A certified version of the G5 could be used as a backup for retrofit and OEM glass panels—a market that's currently occupied by Sandia and L-3, but at higher price points. For now, the G5 is limited to LSA and experimentals and we think it deserves more. Contact [www.garmin.com](http://www.garmin.com).

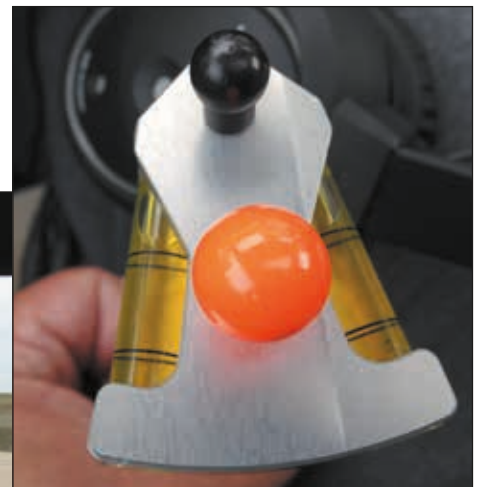
My landings are a lot like my golf drives—inconsistent. That's why I was anxious to check my cockpit seating position with the Eye Aligner, a portable leveling device developed by Florida-based FAA designated examiner Tripp Wacker. After 30 years of administering checkrides, Wacker recognized that landing and airwork performance were proportional to the correct view over the glareshield, but he didn't invent the aligner concept.

Seat height adjustment tools (sight alignment spheres mounted on the glareshield) are common in jets, and every time he climbed into a jet cockpit he wondered why every airplane didn't have one. That's why Wacker and his colleagues eventually designed the \$89.95 Eye Aligner, a high-quality leveling tool that's machined from billeted aluminum and has two fixed sight balls attached. I found it simple to use and stow.

First, adjust the seat travel so you can reach the rudder pedals. Place the device on the highest part of the glareshield and point the apex of the aligner directly at your eyeballs. Center the bubble on both of the levels and then tighten the tensioning knob to keep the alignment stalk from pivoting. Sit up straight in the seat and adjust it so the black small sphere aligns with the larger orange sphere. If the seat is as high as it can go and you can't achieve total eclipse of the black ball (some seats don't have a vertical adjustment), go find a seat cushion.

I'm well under six feet tall and the

*continued on page 32*



*Proper seat height is achieved when the Eye Aligner's orange ball eclipses the black one as shown on a glareshield of a Diamond DA40, main photo.*

# Decathlon and Citabria

*Benign handling makes them worthy of tailwheel transition and aerobatic training, while good supportability makes ownership easy.*



If you want to learn how to fly advanced aerobatic maneuvers, we don't suggest you rush out and buy a Pitts or an Extra 300. Those machines require no small degree of skill to fly safely. Not convinced? Just ask your insurance broker and any aerobatics instructor.

Perhaps the better choice for a newbie might be a Citabria or the Decathlon. You might be surprised that these starter aerobatic airplanes have much more capability than you thought.

Indeed, these models have a lot going for them. They aren't expensive to buy or maintain, they don't have any serious gotchas and almost any pilot of average skill can learn to fly and land them safely. Moreover, they can double as respectable back-country flyers, which is something you're not likely to do in a Pitts or an Extra. Even if aerobatics isn't on your immediate wish list, a Citabria or Decathlon could be the ticket to a tailwheel transition, while you slowly ease into aerobatics.

Even better, these airplanes are still in production at American Champion's factory in Rochester, Wisconsin, from whence comes full support for all the models.

As result, the Citabria is right up

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***These models can't compete with an Extra for exotic aerobatic maneuvers but they aren't intended to do that.***

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at the top of the list for those looking for a simple, fun flying machine capable of most inside positive-G aerobatics. (Citabria is "airbatic" spelled backward.) Available in several versions, with varying powerplants and equipment, the Citabria and its stablemate, the Decathlon, have a great deal to recommend them to the recreational flyer.

## HISTORY

It's fair to say the Citabria goes back a ways—all the way to the begin-

ning, in fact. It's based on the Champion 7-series airframe. The similar, although more rugged, 8 series is used for the Scout bushplane and the more fully aerobatic Decathlon.

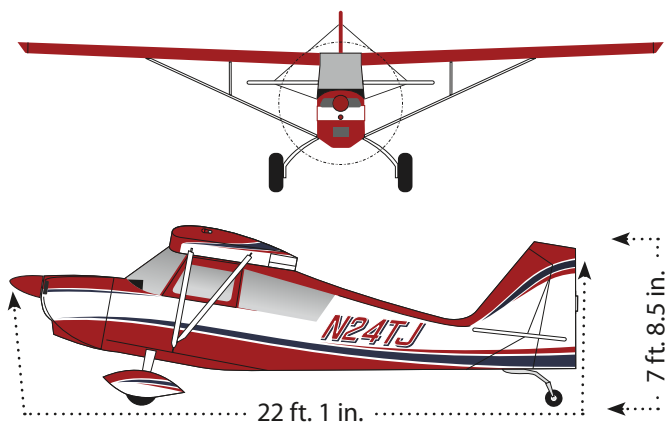
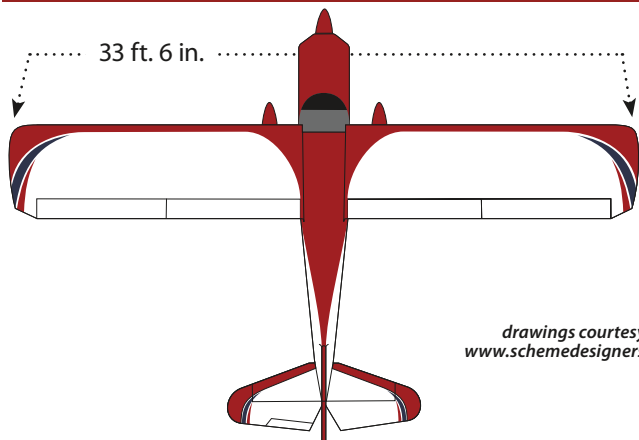
There are a few things to watch for when looking for a Citabria, most notably the wooden wing spars found in pre-1990s models.

There's also the possibility of strut corrosion, similar to what Piper and Taylorcraft owners have been finding for some years. The good news is that American Champion can retrofit new, all-metal wings onto older airplanes for owners who prefer them. Plus, many Citabrias have undergone the upgrade. In addition, a gross weight

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***That's Alan Maurer's 2014 Super Decathlon in the lead photo. That's not the first one he's pulled out of his hangar—he's owned four of them.***

# DECATHLON/CITABRIA

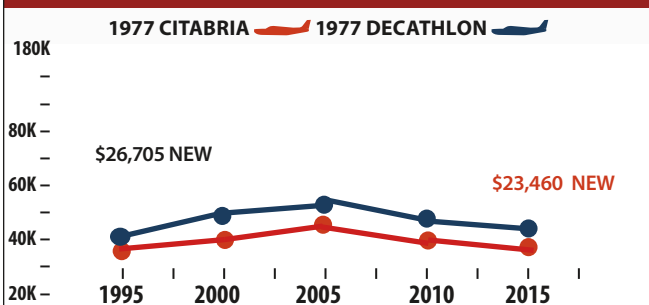


drawings courtesy  
www.schemedesigners.com

## SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1967-1975 7KCAB	150-HP-LYC. IO-320-E2A	2000	\$23,000	36	500 LBS	112 KTS	±\$27,000
1976-1977 7KCAB	150-HP-LYC. AEIO-320-E2B	2000	\$23,000	36	500 LBS	112 KTS	±\$32,000
1994-1998 7GCBC	160-HP-LYC. O-320-B2B	2000	\$21,000	36	500 LBS	110 KTS	±\$53,000
1999-2003 7GCBC	160-HP-LYC. O-320-B2B	2000	\$21,000	36	500 LBS	110 KTS	±\$74,000
2004-2008 7GCBC	160-HP-LYC. O-320-B2B	2000	\$21,000	36	500 LBS	110 KTS	±\$83,000
1971-1975 8KCAB-150	150-HP-LYC. O-320-E1A	2000	\$23,000	40	530 LBS	121 KTS	±\$31,000
1976-1978 8KCAB-150	150-HP-LYC. AEIO-320-E1,2B	1600	\$25,000	40	530 LBS	121 KTS	±\$38,000
1979-1980 8KCAB-150	150-HP-LYC. AEIO-320-E2B	1600	\$25,000	40	530 LBS	121 KTS	±\$46,000
1981-1984 8KCAB-150	180-HP-LYC. AEIO-320-H1A	1600	\$27,000	40	530 LBS	130 KTS	±\$53,000
1992-1994 8KCAB-150	150-HP-LYC. AEIO-320-E2B	1600	\$27,000	40	530 LBS	131 KTS	±\$67,000
1981-1985 8KCAB-180	180-HP-LYC. AEIO-360-H1A	1600	\$27,000	40	530 LBS	130 KTS	±\$71,000
1995-1998 8KCAB-180	180-HP-LYC. AEIO-360-H1A	1600	\$27,000	40	530 LBS	130 KTS	±\$75,000

## RESALE VALUES

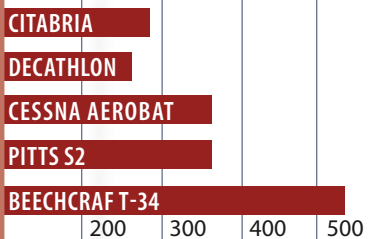


## SELECT RECENT ADS

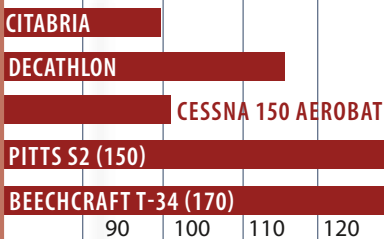
- AD 09-22-02 REAR SEAT BACK HINGE
- AD 00-25-02 WOODEN SPARS
- AD 96-18-02 WING ATTACH FITTINGS
- AD 90-15-15 FRONT SPAR STRUT FITTINGS
- AD 89-18-06 FOLDING FRONT SEATS

## SELECT MODEL COMPARISONS

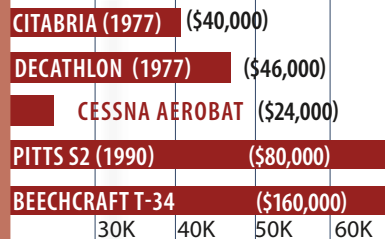
### PAYLOAD/FULL FUEL



### CRUISE SPEEDS



### PRICE COMPARISONS





*On the ground, the Decathlon should be relatively easy for tailwheel transitions. That's an Xtreme Decathlon in the top photo. If the rear control stick looks short, it is. You solo from the front.*

mental O-200 engine. It's the only light sport entry that's also a fully certified airplane. In 1959, the first airplanes that would eventually become Citabrias appeared, dubbed 7GC.

In the years that followed, a fistful of airplanes debuted, each called Citabria.

Eventually there were six variants. In some cases, the differences between models are minor, in others more significant. The nomenclature can be confusing, so here's a run-down:

- 7GC—Produced only in the 1959 model year, it had flaps and a 140-HP Lycoming O-290.
- 7GCB—Essentially the same as the 7GC, but with a 150-HP Lycoming O-320; produced from 1960 to 1964.
- 7GCAA—Aerobatic, with the

same Lycoming as the 7GCB. No flaps. Introduced in 1966 and in production today as the 7GCAA Citabria Adventure.

- 7GCBC—Aerobatic, same as the 7GCAA, but with slightly longer wings and flaps (introduced in 1967) and in production as the 7GCBC Citabria Explorer.

- 7KCAB—Introduced in 1966 as a more capable aerobatic ship, with a fuel-injected 150-HP Lycoming and inverted fuel and oil systems. It was produced through the 1977 model.

- 7ECA—Introduced in 1964 as an aerobatic follow-on to the Champ. Originally, it had a 100-HP Continental O-200, soon replaced by the 115-HP Lycoming O-235. It is in production as the 7ECA Citabria Aurora.

The 8KCAB-150 and -180 appeared in 1971 and 1977, respectively, and sported both more power and constant speed props, which are nice for combination aerobat/cruisers.

Most of these airplanes were built by Bellanca, which went under in 1980 at the beginning of the GA slump. A brief attempt was made to revive the line in 1984, but the timing wasn't right and production stopped again. American Champion acquired the type certificate in 1988 and started production in 1990.

In 1990, American Champion started delivering Decathlons, followed by the Scout in 1993. 1994 saw the reintroduction of the 7GCBC Citabria, followed by the 7ECA in 1996 and most recently the 7GCAA.

The 7GCBC model has proven the most popular, followed by the 7KCAB. (Total production numbers aside; currently the 8KCAB is the most popular, followed by the 8GCBC.) The latter, built as a low-end aerobatic airplane capable of inverted flight, did not last largely due to competition from the Decathlon. The Decathlon, with its shorter wings and semi-symmetrical airfoil, was a better buy for aerobatics, though the 7KCAB is still a fine airplane.

Today's Citabrias are essentially the same airplanes introduced decades ago (although American Champion offers engines with up to 210 HP), with one significant difference: the wing structure. The Bellanca airplanes had wooden wing spars, which sometimes suffered

boost for the metal-spar versions adds utility.

The Citabria traces its roots back to the Aeronca Champion (which everyone called the Champ), one of the crowd of postwar tailwheel trainers that included the Piper Cub, Cessna 120 and Luscombe. The postwar production boom resulted in tens of thousands of these airplanes, but by 1951 the market was saturated and production ended. The 7EC Champ was returned to production periodically and is now being manufactured for the light sport market by American Champion as the Champ, with a 100-HP Conti-

cracks and were the subject of ADs.

American Champion came up with an all-metal structure and incorporated it into all new aircraft. Owners of earlier models can also have the new wings retrofitted. The cost is steep at (depending on model) \$20,900 to \$27,000 per set, plus additional costs for installation and for fabric and paint finishing, but the new wings boost the gross weight, are free of repetitive inspection requirements and surely increase the resale value of the airplane.

The factory can also supply new, improved front struts and aileron spades. All of these are worthwhile improvements to older aircraft. When shopping for a Citabria, extra consideration should be given to upgraded models.

There are a variety of Citabria and Decathlon models in the current lineup (with several engine choices), including the flagship Xtreme Decathlon. This has a redesigned cowling to accommodate a 210-HP Lycoming AEIO-390-A1B6. The Xtreme Decathlon also has a 30 percent increase in roll rate, without altering its ground manners. It also has a longer landing gear and a wide-chord MT propeller. *Aircraft Bluebook* prices a 2014 Xtreme Decathlon at around \$252,000. We covered it in the April 2014 issue of *Aviation Consumer*.

## HANDLING

As tailwheel airplanes go, the Citabrias and Decathlons have benign ground handling characteristics, making them excellent transition training airplanes. Nevertheless, pilots with little or no tailwheel experience must remember the fundamental differences between conventional and tricycle airplanes. On the ground, tailwheel machines are more prone to swapping ends due to the location of the center of gravity aft of the main landing gear.

This means the pilot absolutely must stay alert to side loading of the landing gear. Staying on the centerline and being unfailingly in command of the rudder are keys to success. It also means that the ailerons must be properly positioned for the wind when on the ground. If you fail to do that, you can wind up in a ditch during the landing rollout—a common accident scenario.



*The panel in a Citabria is utilitarian, top, but accommodates a full six-pack of flight instruments. You can do more with a new Decathlon panel, bottom.*



Once aloft, the Citabria and Decathlon are forgiving in virtually all flight modes, although these are definitely rudder airplanes, requiring work to keep the ball centered due to adverse yaw. The elevators and rudder are nicely harmonized, while the ailerons are comparatively heavy and less effective. Adding spades corrects this characteristic and are, in our opinion, worth the price.

Stalls are mild, giving aerodynamic warning whether flaps are up or down, and stall speeds are as low as about 40 knots for the flap-equipped 7GCBC. Citabrias and Decathlons will spin nicely if the ball is not near the center at the stall. Spin recovery is positive, but requires several hundred feet, even if initiated immediately. Although stressed and certificated for loops and rolls, the Citabria is not a serious competition-level machine. It's ideal for initial acro training and unadulterated fun, but only the 7KCAB (and Xtreme) have an inverted fuel and oil system. The other variants

are generally limited to positive-G or G-neutral maneuvers such as inside loops, barrel rolls and the like.

One potential handling trouble spot is PIO (pilot-induced oscillation) during landings. Although not unique to Champions, the spring-steel main gear can bounce the airplane if the pilot dumps it too hard or fails to go around. More bounces, a groundloop and/or nose-over and/or prop strike can result. To prevent these, touchdown for a wheel landing should be as close to zero-rate as possible and for three-pointers, as close to the stall as possible, with the stick back. Land too fast (like in most taildraggers), you'll bounce once or twice or more.

## PERFORMANCE

The cruising speed of the Citabria is sedate: 100 to 110 knots or so, depending on model, so a number of owners use them for travel. The extra power afforded by the larger Lycoming shows up mostly in greater climb rates. The longer wings of the 7GCBC help; according to Champion, the 7ECA climbs at 740



*A Decathlon is certainly worthy for advanced aerobatics, photo above. It's not uncommon to find them in amateur competitions.*

FPM, while the 7GCAA moves up at 1167 FPM and the 7GCBC climbs at 1130 FPM. Decathlons cruise faster.

Takeoff and landing performance are impressive, particularly for the wood-spar 7GCBC. According to our sources, takeoff ground roll is only 296 feet, and a 50-foot obstacle can be cleared in 457 feet, although in our opinion, those numbers are a tad optimistic. Landing distance over a 50-foot obstacle is also in the 900-foot range, with about a 500-foot ground roll. (Older airplanes with lower gross weights will do somewhat better.)

### LOADING, ERGONOMICS

An important thing to note about the new metal wing structure is that it gives the 7GCBC Citabria a gross weight of 1800 pounds, compared to 1650 for the older models. Gross for the 7GCAA and 7ECA was upped in early 2001 to 1750 pounds for metal-spar versions. The Citabrias, especial-

ly early versions, are not known for their load-carrying capacity. While the lifting ability varies according to model and equipment, in general, it's not possible to fill the seats and tanks at the same time.

When two large people wearing parachutes consider aerobatics, they may be approaching gross weight even before fuel is added. Owners report that staying within the CG envelope is not a problem.

The cockpit is laid out so that everything falls easily to hand. Solo is from the front seat and visibility is fair in flight. In the three-point attitude, the nose doesn't block forward visibility. The front stick length gives just the right leverage for the control gearing, especially with aileron spades. The rear stick is short and instructors report that it often takes both hands to get full aileron deflection in a roll in a non-spade aircraft. Each throttle (one for each seat) is where one reaches almost unconsciously with the left hand; the carb heat knob is immediately below.

Most Citabrias have toe brakes, although some of the earliest have that bane of many a pilot's existence—heel brakes. Front seat travel

is limited and short pilots may have difficulty getting full rudder throw without using an extra back cushion. Citabrias and Decathlons are some of the better airplanes for tall pilots, especially as the high roofline means not having to bend over to look out the side windows. The seats are surprisingly comfortable and the cushions snap out quickly when it's time for parachutes. The panel is low and slender, making installation of more than basic VFR instruments and radios challenging. Headsets or ear plugs are a must as the cockpit noise level is about on par with the proverbial boiler factory.

The fuel system is utter simplicity, with three sump drains, one direct-reading mechanical gauge in each wing root and a simple fuel selector. Fuel supply is by gravity feed, of course, but as with all Lycomings, there's also a boost pump.

### MAINTENANCE

Although maintenance is simple, it pays to seek out a mechanic who's familiar with tube-and-fabric airplanes and, if looking at an airplane with the older wing, who has experience with wood. The covering is Dacron, which is durable, although not good for a lifetime. Owners suggest keeping the airplane out of the sun and we agree. Owners and mechanics tell us that aside from making certain the ADs are complied with, especially AD 2000-25-02 R1 on wooden spar airplanes, a serious look at all of the fuselage tubes, especially those aft and low, for corrosion and proper inspection of the wooden spars, there are no particular trouble spots to watch for when shopping for a used Citabria. Early model wing struts had thinner, .035-inch wall thickness as compared to the more recent .049-inch wall thickness. AD 77-22-5 called for replacement of the old struts, and most if not all airframes should have the heavier struts installed; the presence of a placard limiting speed to 153 MPH is proof of the thinner struts.

Also watch for cracked seat backs. There have been accidents in which the pilot's seat back failed, planting his torso on the aft stick with disastrous results. The landing gear U-bolts can develop cracks, especially in airplanes subjected to rough fields or training.

It's difficult to find a Citabria that has not been groundlooped at some time in its life, simply because they are tailwheel airplanes. A ground-loop by itself is not cause for alarm; the trouble arises when the loss of control results in a wingtip and/or prop blade hitting the ground or the landing gear being damaged. Wing damage repair is not always recorded in the logbooks, so inspect any Citabria for wing repairs, especially, as the experts tell us, because most wood spar compression cracks can be traced to an impact event, usually from a groundloop. A full set of service bulletins should be a part of any owner's library, since they can point out areas of weakness.

The new wing structure was developed as the result of cracks in Decathlon wing spars, not those of the Citabrias, so the presence of wood is not necessarily a deal-killer. Nevertheless, years of movement of aluminum ribs against a wood spar means we'd look carefully before buying a wood-spar Citabria.

Students can err and blast right through redline airspeed, so a buyer should assume that an airplane capable of aerobatics has been doing them and that pilots have made mistakes in the process, so inspect the wing and tail carefully.

Fortunately, the Citabria's systems are simple and inexpensive to maintain, so previous owners are more likely to have kept things up to snuff than owners of more complex, expensive and labor-intensive hangar queens.

**SUPPORT**

Unlike many airplanes, there's a variety of sources for parts. First and foremost, of course, is American Champion. They're located in Rochester, Wisconsin (262-534-6315), or on the web at [www.americanchampion-aircraft.com](http://www.americanchampion-aircraft.com). We like the fact that the factory puts a number of its service bulletins and technical information on its website as a free service.

Another source is in Santa Paula, California, home of CP Aviation (805-525-2138) and Screaming Eagle aircraft (805-525-7121), a pair of shops that specialize in the line. CP Aviation also offers aerobatic training in Citabrias and Decathlons.

For owner support, it appears the Citabria Owner's Group has

disappeared, but there's a Bellanca-Champion Club based in Coxsackie, New York, with a website at [www.bellanca-championclub.com](http://www.bellanca-championclub.com). The site has training, operating and parts manuals for sale, plus it has a member forum.

**OWNER FEEDBACK**

My present airplane is a 2014 Super Decathlon. It's difficult to find anything negative about this airplane. This is my fourth one since 1977. The first two were from Bellanca and the last two were from American Champion. These airplanes are truly rugged and virtually trouble-free. The Lycoming engine is bulletproof and in general, maintenance consists of changing the oil. In my experience, an annual inspection in Florida is around \$2000 and unexpected maintenance seldom happens.

The Decathlon is a great tailwheel airplane and lots of fun to fly. Aerobatics are straightforward and for sportsman category figures, it is really good. Insurance for me is about \$2800 per year and I probably pay extra for being over 70 years old.

Fuel consumption at 75 percent power is 10 GPH. The Super Decathlon is not as noisy as the Extreme Decathlon model, plus the stick forces are lighter. The airplane cannot compete with an Extra for more exotic aerobatic maneuvers, but it is not intended to do that. Tailwheel instruction is a must, however.

Solo flying is done from the front seat, and with the high wing, visibility is unlimited. While there really are no major mods that I know about, my wish list is small. I would like a few closable pockets in the cabin for storing stuff, and would love an elevator trim in the rear. Trim is very sensitive and is a big part of flying the Decathlon. Cruise speed will be around 130 MPH.

The avionics in my panel consist of flat-screen Garmin equipment, including a GTN650 touchscreen navigator and an aera796 GPS in a panel dock, plus an all-in-one color engine display.

I like to refuel the plane myself to check the fuel caps. Also, when strapping in to the Hooker harness, one must be sure that it is not hung up on the rear seat rudder pedals. Once strapped in, fresh air ventilation is quite good. For cold days, the



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## CITABRIA/DECATHLON PRANGS: RLOC

Our review of the 100 most recent accidents involving the American Champion Citabria and Decathlon (not Scout) lines turned up some good news regarding design of the airplanes and some distressing news regarding the judgment of their pilots.

The good news first: Despite it being the single largest cause of bent metal and fabric, the runway loss of control (RLOC) rate of 30 percent is remarkably low for tailwheel airplanes—about half that of the Super Cub and Husky. In addition, we saw only four nose-over/flip-over accidents—three of which were due to the surface of the off-airport landing area selected. Only one flip-over was due to misusing the brakes, a tiny fraction of the rate for Super Cubs and Huskies. It's long been said in aviation circles that the Citabria is the standard by which tailwheel ground handling should be measured. We think the data supports the assertion.

When it comes to giving kudos to design features, we'll add the fuel system. Accident data reflects that the fewer options the pilot has when it comes to selecting fuel tanks, the less likely he or she is to have a fuel-related engine stoppage. Because of the simple on/off fuel system of the Citabria and Decathlon, only one pilot managed to get the big silence up front—he used all of the fuel in the tanks before getting to his destination.

We did not expect to see four gear collapse accidents. All were due to lack of maintenance—failure to inspect, detect and fix cracked or corroded components.

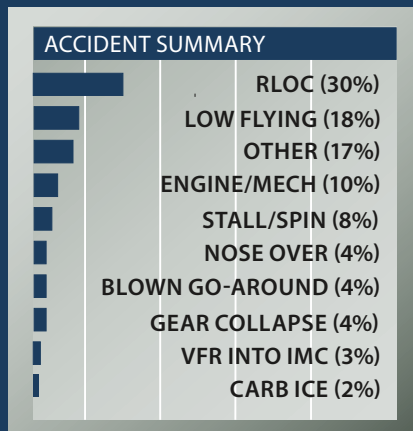
Maintenance was an issue on half of the engine stoppages; the causes of the other half could not be determined. In one case, the mechanic improperly installed the carburetor air filter. It came adrift shortly after takeoff and blocked the flow of intake air. Unfortunately, the pilot tried to turn back to the runway, stalled, crashed and was seriously

injured. The carb air filter accident was not included in the eight stall/spin accidents listed below because we had to choose between causes and took the one that started the accident chain.

Nevertheless, the number of stall/spin accidents did make up part of the distressing news side of the Citabria/Decathlon story—an almost shockingly high rate of crashes due to poor judgment of the pilots. Most of the stall/spin accidents were during maneuvering—often aerobatic—flight. In one case a pilot who had a reputation for doing low-altitude aerobatics over mountain lakes did it once too often and spun in.

A decision to fly low led to 18 crashes. We don't know what it is about getting into maneuverable two-place airplanes that causes pilots to shut off their good judgment brain circuits but, combined with stall/spin accidents, it caused a quarter of all Citabria/Decathlon crashes. Pilots flew into powerlines, trees and the ground. Five were doing aerobatics. One pilot stuck two 11-year-olds in the single back seat of a Citabria, decided to give them a thrill by flying low and hit powerlines, killing himself and the kids.

We were impressed by the pilot whose seat collapsed aft while performing, low level, at EAA Oshkosh. It forced the rear stick to the aft stop, causing an accelerated stall. He managed to rectify the situation and land safely.



heater works very well. For me, it's easy to recommend the Super Decathlon and everyone on the ramp comes over to have a look at it. It's so much fun.

Alan R. Maurer  
via email

Since February 2015 I've been the fortunate owner of a 1992 Super Decathlon 8KCAB, which I purchased in Minden, Nevada, and relocated to my home airport in Salt Lake City, Utah.

I first had an opportunity to fly a Super Decathlon during emergency maneuvering/introduction to acro training with Rich Stowell in 2012. Although most of my flight time was in tricycle gear C-172s and Rockwell Commanders, I earned my tailwheel endorsement in an Aviat Husky. Over time I found myself drawn more to the taildragger style of flying. When I found N9AC in *Trade-A-Plane* I decided to jump at the opportunity to switch over to the "dark side" (to me, that just sounded so much better than "Conventional Gear").

Since the purchase, I've added an AirWolf remote oil filter, replaced an oil cooler due to a cracked mounting bracket, installed a new battery and a battery tender, replaced brake disks and pads and installed a Tanis engine heater. The aircraft went through a thorough annual inspection last fall, so from an ongoing maintenance-cost perspective, I'm expecting few unpleasant surprises. Oil analysis is confirming that the Lycoming IO-360 is holding up well at approximately 500 hours since overhaul. Oil consumption hasn't been an issue at roughly one quart per ten hours of operations, and it doesn't leak a drop of oil on the hangar floor.

The aircraft has been hangared most of its life. Maintaining and cleaning the fabric has been a breeze, using wash and wax products specifically made for fabric and readily available from Aircraft Spruce or Pilot Mall.

I had considered a lower horsepower, fixed-pitch prop Decathlon to keep acquisition costs down, but opted to go with the more powerful Super Decathlon with a constant-speed prop. This was a good decision with the higher density altitudes in



*That's Roger Hamilton's 1999 8KCAB Super Decathlon, top photo. As with any fabric aircraft, we think hangar storage is a must.*

this part of the country.

A previous owner upgraded the landing gear attachment hardware, so the aircraft has an extra 150 pounds added to the gross weight, although I primarily fly the aircraft solo. I can carry full fuel and still remain well within the lower aerobatic weight limits.

The previous owner installed a Garmin GNS430W GPS navigator—a bit of overkill—but having that WAAS-based location source will help reduce the sting from meeting the 2020 ADS-B requirement. For me, I have no choice given my close proximity to a Class B airport.

Aileron spades were also added to my Super Decathlon, are quite effective and hurt like hell when I invariably bonk my head on them!

Fuel burn has varied depending on my flight activities—from 8.5 GPH to around 10 GPH. With just about 12 hours of tailwheel flight experience at purchase, my initial annual insurance was \$1956, but the recent renewal dropped to \$1672 now that I've accumulated about 70 hours of flight time in this airplane.

Operations are simple with the limited systems installed, although a Stratus portable ADS-B system and an iPad mini are on board for every flight, if for no reason other than

traffic avoidance. Plus, it looks cool. Ground manners are quite benign and visibility over the cowling is excellent—no need for S-turns while taxiing.

Flying the Super Decathlon is a delight. Things seem very well balanced, responsive and sports car-like compared to anything I've flown previously. Climb rates are a hoot, so the occasional botched wheel landing can be easily recovered from and converted to a three-point with plenty of runway to spare. Pattern work can be flown nice and tight, maximizing the number of touch and go landings when a lack of student pilots flying 747 patterns allows. Also, there is plenty of power to spare while flying through the higher-elevation Wasatch Mountains here in Utah. My aerobatic skills and—at 62 years old—my G-force tolerance remain works in process, but the Super Decathlon is quite forgiving of any sloppiness or errors on my part.

The best part on warm summer days is flying in short sleeves with an elbow out the window enjoying a great plane. I'm looking forward to making the flight back to AirVenture at Oshkosh this summer and making it an adventure flight in a taildragger. It won't set any speed records, but the Super Decathlon does make for a decent cross-country flyer.

*Aviation Consumer* magazine is the best! I read it cover-to-cover every month.

Roger Hamilton  
Salt Lake City, Utah

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## DA62

(continued from page 11)

and the fuel flow drops to 11.8 GPH and range increases to just over 1000 miles at about 160 knots. The DA62 will do that with four or five people aboard and more than 100 pounds of bags. Baggage can go in the rear or in two nose compartments large enough to accommodate golf clubs.

Traditionally, people fly light twins because they want the safety of the second engine. But that comes with the challenge of handling an engine out. Light twins and really twins other than turboprops haven't proven to be stellar performers when one engine tanks. More than one twin has crashed because the pilot misidentified the failed engine or otherwise muffed the engine-out drill.

That should never happen in the DA62. The engines are equipped with auto-feathering and although the DA62 has a critical engine (the left), engine-out drills are stupid easy. Shut off the engine master and the rest is automatic. Bring it back by turning on the master and tapping the starter button. (There's a two-minute limit on flying with one shut down.) Without much drama, we coaxed a 450 FPM climb on a single engine at 6000 feet.

### CONCLUSION

When we flew the DA42 for the first time in 2005, we deemed it as refined. The DA62 is the same, only more so. The engines are smoother, quieter and more powerful and remain among the most economical piston powerplants in general aviation. Diamond deserves credit for engineering in good passive

safety through both handling characteristics and crashworthiness. The company's extraordinary safety record bears out this effort. The DA62 is but an evolution in Diamond's design philosophy that improves performance, capability and comfort, albeit at a price that's hardly for the masses.

If we had any complaints about the DA62, it would be the short TBO. In an airplane this expensive, those engines ought to last longer. We'll see if operating experience justifies longer TBOs. In the meantime, we're sure that for owners who can afford one—the lucky 25 to 35 a year—accumulating that first 1000 hours will be enjoyable indeed.

### CONTACT...

Diamond Aircraft  
888-359-3220  
[www.diamondaircraft.com](http://www.diamondaircraft.com)

## EYE ALIGNER

(continued from page 23)

aligner proved that I sit low in all but the smallest cockpits, although when flying a float-equipped Piper Cub from the rear seat, the Eye Aligner indicated that I still needed a seat cushion for the proper view outside. It's tough to say if the device is the cure-all for my inconsistent landing performance, but the more I use it, the more I think it erases my improper seating position as a variable.

"The important point about the Eye Aligner is that if you use it every

### FEEDBACK WANTED

## CESSNA 206



For the September 2016 issue of *Aviation Consumer*, our Used Aircraft Guide will be on the Cessna 206 Stationair. We want to know what it's like to own these aircraft, 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 (full-size, high-resolution please) you'd like to share to the email below. We welcome information on mods, operating expenses or any other comments. Send correspondence on the Stationair by July 1, 2016, to:

Aviation Consumer  
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time you fly, you'll at least have a consistent sight picture," said company spokesman Chad Battelene.

Battelene noted that the Eye Aligner isn't just a ticket to better landings, but it can also benefit the quality of your inflight maneuvers. "For making steep turns, we're taught to reference the aircraft cowling to the outside horizon. If you're sitting too low or too high, you won't have a precise reference," he noted.

The Eye Aligner, which is patent-pending, is intended for all pilots—not just students. As Battelene put it, "Many airline and corporate jet pilots use alignment devices every time they climb in to the cockpit. Now the rest of us can do the same."

The \$89.95 Eye Aligner is available through Sporty's ([www.sportys.com](http://www.sportys.com)) and by visiting [www.sightforflight.com](http://www.sightforflight.com).