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*The consumer resource for pilots and aircraft owners*

# The Aviation Consumer®


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The Aviation Consumer

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## VISUAL APPROACHES—THE GARMIN WAY

We recently showed a piece of B-roll that shows a later-model Garmin Perspective+ equipped Cirrus on a night visual approach with a windshield full of red-over-red VASI and an approaching dark tree line underneath. There are a bunch of things going on in that six-second clip worth talking about, besides its muddy image quality that plays illusions on the dark terrain around the airplane. Just the same, it's likely the view you'll have approaching terrain on a dark night—mostly nothing. Link to the video, which focuses on the Cirrus IQ data logging features, at tinyurl.com/yawolh4h.

Leading the way in the night approach footage is Garmin's visual approach guidance, which is a procedure that's fetched from the G1000's FMS and loaded as an approach with vertical guidance. Visual approach procedures became a standard feature in the G1000 NXi and in Garmin's GTN-series retrofit navigators and if your data is current, you'll find them in the database. Garmin isn't alone with the utility. Visual approach procedures are also in the Honeywell Apex avionics in the Pilatus PC-12, and in the FMS databases in plenty of other turbines. It's compelling automation—the autopilot flies the active procedure as it would an instrument approach, but while it does, your eyeballs need to be outside. Here's why.

Unlike instrument approaches, supplemental visual approaches are not defined in the system's navigation database and don't follow a precise prescribed path. Trees? What trees? Instead, the system calculates the lateral and vertical path for the chosen runway and builds visual approach waypoints based on runway position and course, as the data is written in the navigation database. In the footage, the PFD shows the autopilot flying the vertical portion of the visual approach pretty much on the glideslope, give or take a half-dot deflection in the usual downdrafts coming over the river on final. There's some camera illusion that makes it appear the airplane is descending to the trees, but it's not, and it's well above stall speed and at the sweet spot for the SR22T in landing configuration. The aircraft also has the EVS enhanced vision camera system, and there's an expanded synthetic terrain profile view on the system's VSD, or vertical situation display. In the real world and visible out the windshield is a row of diagonal red lights prior to the runway threshold. These lights are on top of a river dike, where the approach crosses on short final. But with Garmin's glideslope centered, the VASI screams the never-forget warning that when red over red, you're dead. There's a reason for this and you have to hit the pilot's guide to understand it. The study is worth the effort.

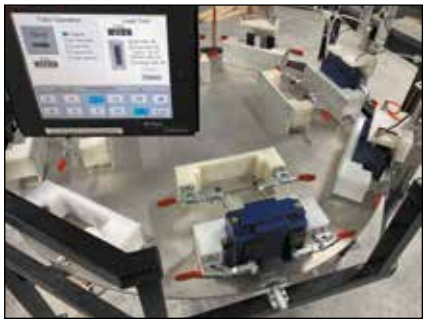
I found it in Flight Management section of the Cirrus pilot's guide, sourced from the Perspective+ Avionics course in the Cirrus training portal. The visual approach procedure broken down, each visual approach will have two transitions—the straight-in (STRGHT) and the Vectors-to-Final (VECTORS). The visual approach waypoints/fixes consist of the initial fix (STRGHT), the final approach fix (FINAL) and the runway approach point (RW--). So here's why the VASI/PAPI might not agree with the VDI on the PFD. Garmin's visual approach guidance maps a 3-degree glide path, calculated from the missed approach point up to each waypoint along the extended straight-in path. But the VASI to this approach is 4 degrees, showing reds when the automation says the airplane is on the slope, or at least the one calculated for 3 degrees.

The takeaway is summarized in the release of liability, written pretty matter-of-factly in the pilot's guide and on the screen when you ask the FMS to load the procedure. The language to live by: For visual approaches, the pilot is responsible for avoiding terrain, obstacles and traffic. And, when a visual approach is selected, the message "Obstacle clearance is not provided for visual approaches" is displayed on the approach selection page. It's an Enter push to acknowledge before the visual approach is even loaded into the flight plan. Still don't get it? This is, after all, a visual approach to supplement the eyeballs that have to be outside while you keep the airplane out of the trees, precisely as it was done in the footage. *—Larry Anglisano*

## SMART BATTERIES

I read the article on lithium batteries in May 2020 issue of *Aviation Consumer*, and certainly agree that the EarthX ETX-900 TSO—with the potential for a 22-pound weight savings versus a Gill G3—is a good thing.

However, I was looking at the company's webpage and noticed that the EarthX battery is only 15.6 amp-hours and weighs 5.4 pounds. The Gill G35 is a 23 amp-hour battery, so it's got about 30 percent more capacity, but it weighs 27 pounds.



I just wanted to point out that in the event of an alternator failure, the EarthX will likely keep essential electrical accessories running for a shorter period of time. Still, a graph on the company's website shows that reducing the overall current draw to 8 amps in an emergency, the battery should last 100 minutes.

As a comparison, the battery in my Beech N35 Bonanza is a Concorde RG-35AXC. It's a 33 amp-hour battery and weighs 32 pounds. I just ran the yearly load test and determined that it can run essentially everything I can turn on besides the A/C blower (a 33-amp draw) for more than 51 minutes. That's a lot of emergency reserve, and probably more than I really need.

Justin Graff
via email

Thanks for the nicely researched article on smart aircraft batteries in your May 2020 issue. I've had bum luck with the last two batteries I've installed in my Citabria (admittedly I don't fly it as much as my go-places airplane), and I do keep it on a battery tender per your recommendations. I asked my shop if it can do an FAA field approval to install the EarthX but it said to wait until it has an STC. Do you guys think this will be a reality? Thanks for your good work.

Ben Turner
via email

*When it comes to FAA certification we've learned a long time ago that nothing is a sure thing, and counting on a certification date leads to disappointment.*

*Still, EarthX has enjoyed sizable success with its batteries in the experimental market and that has to be a good thing going into the rigors of FAA certification. We'll keep an eye on it.*

## ARCHER DIESEL COREX

In the April 2020 *Aviation Consumer* Used Aircraft Guide about the Piper Archer you reported that the Continental CD-155 diesel has a TBO of 1200 hours. That is incorrect; the engine has a TBR of 1200 hours. After that hour the engine must be replaced and cannot be overhauled. Thank you for a great publication.

David Williamson
via email

## DYNON HDX CERTIFIED INSTALLS

Thanks for the update on Dynon's certified version of the SkyView HDX. Ever since your field report on the system's installation in a Cessna Skyhawk (July 2019 *Aviation Consumer*) I've been seriously considering this system for my Bonanza, weighing the options with Garmin's offerings. But what's holding me back from committing to the Dynon is the autopilot interface for my Bonanza. Last I checked with my IA (who installed some Dynon avionics in my experimental seaplane) the Dynon autopilot wasn't approved in the interface for the Beech F33, and my goal is to get rid of the King KFC150 and the gyros that drive it.

Two questions: Does Dynon have any plans to expand the autopilot capability/approval within the certified version of the SkyView? And if I remove the KFC150 is there a demand for it on the used avionics market? Love your magazine.

Jim Copeland
via email

*When we talked with Dynon's Michael Schofield in March 2020, he said that expanding the autopilot approvals for the HDX was in the works.*

*As for selling the KFC150, there might be some demand, but it's probably worth more to someone for parts rather than for a new installation.*

**On The Cover:** **That's a production hangar for Cub Crafters, a brand that should be on the shopping list if you're in the market for an ultramodern LSA taildragger. In a changed aircraft sales environment, it's logical to consider a used LSA, but how does the buy-in and cost of ownership compare to legacy trainers like the Cessna 152 or Piper Tomahawk? Editor-at-Large Paul Bertorelli crunches the numbers starting on page 4 of this issue.**



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# LSA or Legacy? Costs Compared

*As the once-new LSA fleet ages, the airframes are more affordable. But are legacy two-placers a better value?*

*by Paul Bertorelli*

**CHECKLIST**

- Ten-year-old LSAs are the bargains these days. Lots of capability and cheap operating cost.
- Older standard-category airplanes are dirt cheap, but may require medicals.
- Against a Rotax-powered LSA, a cheap two-place standard-category will have slightly higher costs.

When the light sport aircraft idea first broke ground 20 years ago, the idea was a new class of airplanes bridging between so-called "fat ultralights" and standard-category airplanes whose inflated prices made them unaffordable save for the wealthy few. Two decades later, has the experiment paid off?

Yes, but with some qualifications.

**MARKET ANALYSIS**

Light sport airplanes were supposed to be simpler to build and certify—they are—and although the original design brief didn't specifically say so, it was assumed they would be cheaper to buy. They are that, too. But only relative to new, standard-category airplanes and not compared to any of dozens of legacy two- and four-place airframes with similar or greater capability.

*South African owner Kai Neckel's Flight Design CTSW, above. "Amazing overall package...great cruise and very roomy. Excellent useful load."*

So, are LSAs cheaper to own than equivalent legacy airplanes? The answer depends on how you crunch the numbers, but if investment costs are tallied, the answer is no. If operating costs alone are considered, light sport airplanes look attractive against both legacy airplanes and definitely any new standard-category aircraft.

## COMPARED TO WHAT?

Why do people buy light sport airplanes? Probably for exactly the purpose they were intended: Remaining in the flying game with modern

*The venerable Aeronca 7AC Champ, left, is the hands-down best value in legacy LSAs. And good luck putting a CTLS on skis, as owner Pete Burns has done with his Champ.*

airframes with modest performance. Although light sports haven't been a runaway sales success, the total population of aircraft totals about 4000 airframes, according to www.bydanjohnson.com, which tracks production by models. And don't look now, but sales of LSAs have recently accounted for between 19 and 21 percent of all piston aircraft sales, according to Johnson's site and GAMA reports. (That includes E-LSA kits, but not gyroplanes.)

In 2018 and 2019, the LSA segment registered 219 and 233 aircraft respectively, against total GA piston sales of 1137 and 1324 for the same years, according to GAMA. Those totals include 80-plus airframes from the five manufacturers who are GAMA members: Icon, Pipistrel, Tecnam, CubCrafters and Flight Design. The rest are from non-GAMA companies. Johnson warns because of fuzziness in the data, a precise market-share calculation is elusive. Still, LSAs have measurable presence.

As we've reported before, the LSA market is nothing if not lousy with variety. Dan Johnson's site counts a dozen manufacturers delivering modest volume. Recent market leaders include Zenith, Kitfox, Van's, Rans, Pipistrel, Icon and Progressive Aerodyne. Flight Design once topped the market, but it's now clawing back after financial retrenchment.

The typical price of a well-equipped LSA—and few buyers skimp on options—is north of $150,000. For our survey group of a dozen owners, the average price was $117,000, but some of the owners bought used airframes. The high price was $175,000.

At this juncture, you can slice the loaf two ways by asking what else $150,000 buys or what would an equivalent two-place airplane cost? This produces radically different outcomes. The 150 large would get you a nice late 1980s Mooney, a late 1990s Skylane or an early 2000s Skyhawk, for example. But it appears that buyers shopping LSAs don't engage in that kind of calculus. They aren't looking for price-value, exactly, as much as they are simple, easy-to-fly and easy-to-maintain airframes. Many of them are stepping down from more capable aircraft, including piston twins and even turbines. If cheap is the overarching driver in a two-place airplane, the pickings, while not necessarily slim, are vintage, not to put too delicate a point on it. Consider the last model year of the Cessna 152, 1986. Find them in the low- to mid-$40s to as much as $90,000 for a fully restored airframe. Piper's two-place trainer, the Tomahawk, goes for a song and a parsimonious one at that: $14,000 to $20,000. The Beech Skipper is another possibility that's a better flyer for around $16,000. And don't forget the venerable forerunner of the 150, the 120/140 series. Again, prices for these are in the $25,000 to $35,000 range and some have been nicely restored. There's also a passel of Pipers to pick from, including the J-3, the Super Cub, the Colt and even the Tri-Pacer if you want a backseat.

*Van's RV-12 has become a popular E/S-LSA. Ian Heritch's example, above, has flown coast to coast and was purchased new three years ago.*

The immediate downside of these is most are standard-category airplanes and thus require the pilot to have a medical. While some thought BasicMed would decimate the light sport segment because pilots would have no worries about the medical issue, this is evidently not the case or at least is far less influential than we imagined. Several owners told us medical certification—or lack thereof—was a consideration in their purchase of an LSA and that BasicMed didn't change that.

## COST OF MONEY

For our email survey of a dozen LSA owners, we asked about purchase price, insurance, fuel and hangarage costs and maintenance. But first, let's dispense with the largish pachyderm on the premises: depreciation. This is always a slippery number, even for legacy airplanes and it's all but impossible to calculate a meaningful average. For one, there aren't enough sales of these airplanes to establish take-it-to-the-bank trends and for another, ultimate value is determined between the buyer and seller the moment the check is signed. But let's do some for instances.

A CubCrafters Carbon Cub bought new in 2015 for $200,000 depreciated to $165,000 four years later or about 18 percent. Call it $9,000 per year. A Flight Design CTLS retailed for $156,500 in 2015 and now, according to Aircraft Bluebook, it's typically worth about $115,000 for a depreciation of 27 percent or about $10,000 a year. For a longer timeline, consider Tecnam's P92 Super Echo. It sold new in 2008 for $115,000 and now retails for about $45,000 for a loss of 61 percent value over 11 years or a decline of $6000 a year.

These exact values matter less than the fact that newer airframes will depreciate more than older ones will and it's a real part of the cost of ownership. Older airplanes, say ragwings like Cubs and Champs or vintage Cessna 150/152s, will depreciate less or not at all. Some even appreciate slightly with mar

*Bill Spencer in his Legend Cub, above. "The LSA rules have allowed me to own and fly beautiful and well-equipped new airplanes."*

ket swings. Although many owners seem to purchase airplanes without financing, if a loan is required, the cost of that money should be added to depreciation.

## TALLYING IT UP

Apart from purchase, depreciation and cost of money, the next largest expenses will be either fuel or insurance, according to our survey. That's dependent on how much you fly, but the owners we surveyed averaged about 70 hours a year and reported an average of $19 an hour for fuel.

Using those numbers, fuel totals about $1330 a year. Much of the LSA fleet is powered by Rotax 912-series engines and although they'll burn 100LL, they're a lot happier on unleaded mogas. Many owners use that or, often, a mix. This may have a slight advantage in conferring better aging of the fuel, but even 50 hours a year on mogas is unlikely to cause varnish or deposit issues. Rotax recommends a shorter oil change interval when avgas is used: 25 hours if 100LL is used 50 percent of the time versus 100 hours if unleaded fuels are burned. Most owners stick to 50 hours or less for oil changes, whether flying with a Rotax engine or a legacy Lycoming or Continental.

Insurance is becoming a sticky point for owners and with the market hardening, it may be getting stickier yet. The average insurance cost among our dozen-owner survey was $1534. The highest was $3200 on a recent vintage Flight Design CTLS, the lowest $909 for an RV-12. Straight-up comparisons against legacy two-seaters are difficult because insurance on a Cub, a Champ or a Cessna 152 can cost just as much, depending on hull value.

The bigger driver may be pilot age. As the market hardens, more insurers are raising premiums on older pilots, if they're not turning them down entirely. "Insurance has been $1100 a year. For the May 2020 renewal, it will be $1700 a year for a hull insured at $89,000. Time to lower the value," said Flight Design owner John Horn. At these prices, more owners may be considering self-insuring the hull or entirely.

## OPERATING COSTS

If anything is a constant in aviation, it's that's bigger, faster airplanes burn through money at a faster rate and the near-ruinous annual is always in the offing. In that respect, legacy two-seaters and LSAs are definitely less money hungry, starting with annuals. Owners in our survey reported the average cost of an annual as $529. That requires amplification, however. Two of the owners in our survey group invested in a two-week course for the Light Sport Repairman Maintenance rating, which allows them to repair their own airplanes, including annual inspections.

While IAs can't be fashioned in two weeks, we think this rating is a terrific idea. It costs up to $5000, but the real value is in engaging an owner in understanding the airplane, inspecting it for faults and repairing it when needed. In our view, that's not just a cost benefit, but a safety enhancer, too. We asked owners if they had experienced any unusual maintenance issues, costs or problems that hadn't been expected. None had, and all said the maintenance expenses were about what they expected or a little less. None had any complaints about the Rotax engines that power most of these aircraft. There were no reports of maintenance disasters such as corroded spars or major, timed-out parts.

What to compare the Rotax to? We can think of only three possibilities: the Continental A-65 found in Cubs and Champs, Lycoming's O-235 or the Continental O-200, the lightened version of which is used in a few LSAs. The A-65 is on par with the Rotax for fuel burn, but the O-200 and O-235 are a tad thirstier. All three legacy engines are stone-age throwbacks compared to the Rotax, which has electronic ignition. The 912 iS also has fuel injection.

The Rotax is cheaper to overhaul. Dean Vogel at U.S. Rotax distributor Lockwood Aviation says the base overhaul price for a 912 ULS is $13,500, assuming a good core. A factory-new engine costs $19,000. The price delta between a new O-200 and an overhaul is larger and you can't even get a new A-65, although new cylinders are available. The A-65 remains a serviceable choice, but overhauls are in the $15,000 to $18,000 range.

Vogel told us Lockwood advises owners of high-time or high-use aircraft to make the overhaul decision 500 or so hours before TBO. He said the engine can be sold on the used market to a homebuilder and the owner can then buy a factory-new engine, applying the considerable proceeds from the used engine sale.

## TYING IT UP

Owners who bought new or recent used light sport airplanes seem satisfied with the purchase and operating costs and report no unpleasant surprises, nor regrets in having made the purchase. These owners were a mix of step-down buyers and bucket listers who always wanted to own an airplane and found the ability to do that in an LSA.

"From my experience, LSA has become an accepted and somewhat vigorous part of U.S. general aviation," said RV-12 owner Ian Heritch.

"Wherever I go, I get only compliments and questions from onlookers. I have experienced no hostility for operating in the airspace system. While not the super-robust category that many were unwisely expecting, LSA has safely, smoothly and successfully joined the U.S. aviation family," he adds. "If you want to keep flying, this is the way to go," adds CTLS owner Ben Short.

But the design brief is to determine whether an LSA is cheaper to own and operate. It can be, if it's bought right. If you don't factor in the steep depreciation a new aircraft suffers the day after you take delivery, then new and used are comparable. "Bought right" to us means an airframe that's had the painful part of the depreciation already squeezed out of it. That means at least five years old, but 10 would be better.

There are bargains out there. A 2006 Flight Design CTSW is still perfectly serviceable and supported with a typical values in the mid-50s. Newer ones with glass panels aren't much more. Even at the higher purchase price, ownership costs would be competitive with a legacy two-seater. If you can't find or afford a hangar, a glass airplane can live outside or in a shade hangar, which a ragwing—vintage or newer—cannot.

Speaking of ragwings, the Cub-style airplanes appear to hold value better than other LSAs. Specifically, a five-year-old Carbon Cub still commands $165,000, according to *Bluebook*. Arch competitor Legend shows similar price stability, making them a good choice if short-term ownership is envisioned. You can get in and out without losing much.

That's true of all of the legacy models that qualify for LSA operation, too. They've reached rock-bottom value and aren't likely to depreciate much at all, if that's a buying consideration. Some parts for older aircraft are hard to come by, but owners tell us they remain supportable. Just make sure the prebuy filters out expensive gotchas.

## THE COST OF A CUB

**A vintage Piper J-3 is a popular choice for light sport flying and having owned and managed the partnership in one for the past 10 years, I understand why. With no electrical system and stone-age construction, there's simply not much to go wrong in the airplane and maintenance between annuals has been all but nil. But while a more capable airplane can take your leg off at the knee when some unexpected expense surfaces—like an engine—the Cub tends to take little nibbles. For example, the old-style 800-4 tires cost $330 each and another $200 for the tubes. And we had to do the engine six years ago after a cylinder went soft and a rod got wobbly on the crankshaft. At that time, Don's Dream Machines overhauled the A-65 for $12,500. Now they're quoting $15,000 to $18,000.**

**Annuals aren't agita producing, typically totaling around $800 to $1000. But we've had a few that amounted to twice that when airframe repairs, exhaust work or other maintenance came due.**

**Insurance has been as little as $900 and as much as $1300, for three experienced but older pilots and based on a hull value of $36,000. In keeping with market trends, I expect a little higher next year.**

**When I total up my share of expenses in the partnership, $2500 a year covers it—generously. I flew the airplane seven hours last year, which appalled me when the shop informed me of it. I'm on track to fly 50 this year, which makes it worth owning. As most Cub owners will tell you, flying consists of local flights and pattern work. My major cross country is Arcadia, Florida, 36 miles east. It has a nice grass runway as does little Buchan field, seven miles south of Venice.**

**These numbers are lower than a new Legend or even a used CubCrafters model. Lower hull value is one factor, but so are radios and an electrical system. They add to repair costs. Those airplanes burn a little more fuel than the A-65, but maybe dozens of gallons more over the course of year.**

**The newer Cubs are considerably more capable. They're faster and more comfortable, making even longish trips practical if there's no time pressure. In a J-3, such a thing can be an ordeal, not least of which because the old Cubs don't fly as well as the newer versions, which are based on Super Cub airframes.**

**I am saving the next item for last, because like many ragwing owners, I'm suppressing thinking about having to actually do it: Re-covering the airplane. Anyone buying a rag-and-tube airplane should be aware of where the airplane is in its cover cycle. Better budget $30,000 to do this, to allow for repairs to the tube work if it hasn't seen the light of day in 30 years. And that's how long a cover might last, if everything goes just right and the airplane is hangared in a dry climate. Outside? Forget it. If you're even thinking about that, you don't understand.**

**The cost of re-covering can easily exceed the value of the airplane, especially for a Champ, and it will render an otherwise desirable airframe a non-starter unless the price is reduced to allow for the cover work. If you're considering a Cub or a Champ, check the logs carefully for the date of the last cover and have it examined by someone who knows the craft. That might require flying them to the airplane since qualified fabric techs aren't always available where you might need them.**

# Aerobatic Training: Good Times Rolling

*Once flight training resumes, it might be time to act on your dream to fly upside down. Here's what to expect when you strap on a 'chute and go for it.*

*by Rick Durden*

We'll digress for just a moment. As of this writing, much of the country is sheltering at home while we deal with the challenges of COVID-19. We're hearing from pilots via email and social media who are kicking themselves for not pulling the trigger and taking the aerobatic instruction they'd always wanted. They'd procrastinated and now they couldn't—at least for a while—and they swore that when things opened up again, they'd go for it.

They were learning one of the hard truths of aviation—if there's a chance to do something way cool, a lot of fun and that sharpens the skills, grab it. Too often, the opportunity is fleeting.

## LISTEN TO YOUR GUT

You know that you've been thinking that your flying is too often plain vanilla. Deep inside you know that you want to strap into a Decathlon to explore the real third dimension of flight. You want to pull back on the stick and apply a little Vitamin G to your life. You don't want to wind up in the assisted living facility sucking on your gums and bemoaning the adventures you didn't have. It's time to stop with the procrastination, grab a handful of stick, put it to the stops and make the world revolve around you.

**TRAINING**

Besides, stalls give you the heebie jeebies and if you want to get to where they don't bother you at all, an aerobatic checkout will almost certainly do it. It's our considered opinion that in 10 or fewer hours, aerobatic dual will increase your level of pure stick and rudder skill—and your confidence—more than any other flight instruction you'll ever take.

## WHAT'S INVOLVED

We'll start with the obvious—aerobatics involves big pitch and speed changes, which means G loads on the airframe. Done correctly, basic loops, rolls and spins rarely involve more than four positive Gs and one negative. That's not far from the certification limits of a normal-category airplane. The problem is that when you make a mistake—and you will—it's not unusual to blow through those G numbers, and redline airspeed, in a big hurry. Yes, pilots have pulled the wings off of normal-category airplanes. And our general aviation fleet isn't getting any younger. We cannot emphasize too strongly that if you're going to learn to do aerobatics, do it in an airplane certificated in the acrobatic category—and take instruction from a CFI who has been trained to teach aerobatics. DIY aerobatics has qualified too many pilots for a Darwin Award.

*A Pitts Special spending some quality time inverted. Learning to do just that can be some of the most enjoyable dual you ever take.*

## FINDING A SCHOOL

Taking aerobatic training may mean that you get to travel. To find the right school we recommend going to the International Aerobatic Club's website (www.iac.org) and checking for schools in your area. We also suggest talking to pilots you know and respect as well as inquiring on aviation social media sites for training recommendations. To start with, a reputable flight school that offers aerobatic training should be able to provide you with a description of the course it offers, the type of airplane(s) used, the qualifications of the instructor(s) and confirmation that the school

*Patty Wagstaff, rear seat, with an aerobatic student in an Extra 330L, above. Greg Kootnz rolling a Super Decathlon, below.*

provides parachutes.

Our survey of schools offering specialized aerobatic training revealed that courses varied in length from five to 10 hours, with costs from $1600 to nearly $6000 depending on the number of hours, the type of aircraft used and the instructor.

Before you make a final decision on a school, spend some time talking with the instructor you'll fly with to see what is expected of you, what you can expect to learn and get a feel for whether there's a match. If you weigh over 200 pounds you should also make sure that the school airplane has the useful load needed to carry you, the instructor, parachutes and enough fuel for the lesson and reserve. While aerobatic-category airplanes are tremendously strong, many have a limited useful load. Putting it bluntly, you don't want to do aerobatics over gross.

## CONCENTRATED TRAINING

We recommend doing your training in a concentrated manner to maximize knowledge retention between flights. We observed that most schools wanted to schedule the student to go straight through in two to four days (depending on the specifics of the course). Some encouraged students to make the training a part of a family vacation and one—Greg Koontz (www.gkairshows.com)—ties in the training with a bed and breakfast on the airport. (Koontz, in conjunction with the IAC, also offers an aerobatic instructor course scholarship—details are on the IAC website.)

Every pilot we've spoken to about aerobatics is concerned about nausea during training—with good reason. Looping, rolling and generally pulling Gs—while being uncomfortable/uncertain about the whole thing—means that most pilots will develop some discomfort. The aerobatic instructors we know are fully aware of the situation and build in the process of getting used to truly moving in the third dimension into their courses. Put simply, we do aerobatics for fun. If we're in a situation where we're focused on not involuntarily redecorating the cockpit, we're not having fun—and we're not learning. Plus, we've also read the aeromedical literature that shows that a pilot who stops doing aerobatics when it gets uncomfortable rapidly builds a tolerance and stays comfortable longer the next time. The pilot who tries to be Joe Ironjaw, power through the discomfort, loses it and does the technicolor yawn will have a lower tolerance the next time.

## OF COURSE I'M NERVOUS

Of course you're going to be nervous about doing something new in an airplane. Your instructor will know it and should talk with you openly about strategies for dealing with it (if not, find someone else to fly with). In general, don't starve yourself, eat normally, but not a large portion prior to flight. Don't show up with a hangover. Honestly tell your instructor how you feel during the lesson. Stop when it starts to feel uncomfortable, land and take a break. You'll be ready to go again in two

# SPORTY'S INTRO TO AEROBATICS COURSE

Long-time purveyor of all things aeronautical, Sporty's Pilot Shop (www.sportys.com) is adding a new dimension to its online training by going outside of its organization to create a line of courses that delve into specialized areas of aviation. The plan is to team with well-known experts in each specialty. It recently released the first one—an intro to aerobatics course taught by one of the most famous pilots to ever do a Lomcevak, three-time National Aerobatic Champion Patty Wagstaff.

Priced at $49.99, the *Intro to Aerobatics* course can be played on virtually any device you own. The graphics and imagery are what one expects from Sporty's—absolutely first rate. That's a screen grab at right from one of the videos in the course showing Wagstaff flying her Extra 300L in an airshow.

The course's *Intro* title is accurate. As Sporty's John Zimmerman told us, "It's a survey course to get you started into the world of akro." We agree. It's Akro 101; a wide-ranging look at aerobatics that covers a great deal about the sport—history, regulations, physiological considerations, safety, types of aerobatic airplanes, finding a flight school and maneuvers—but, in keeping the course to a reasonable length, does not go deeply into any of the many subjects it addresses.

The course is set at Wagstaff's flight school on the St. Augustine, Florida, airport. It features two of the airplanes her school uses for aerobatic instruction, a Super Decathlon and Extra 300L, as well as her highly experienced aerobatic instructor and airshow pilot colleagues, Allan Moore and Spencer Suderman.

We liked the breadth of the course—simply because there is a great deal to consider when deciding to learn aerobatics. It covers the FARs that are applicable, notably the minimum altitude, where you can and cannot do aerobatics and parachute use. It also goes into the current world of competition akro and that you can get individual approval to do aerobatics at lower altitudes as you develop and demonstrate your skills. Want to become an airshow pilot? The course explains what's involved and provides a little taste of what it's like.

We appreciated the short segment on "stunt" flying and the explanation that it is usually for one-off events for such things as movies or TV commercials and is done after careful planning and mature consideration by highly skilled pilots. Without expressly saying so, it makes it clear that getting maximum performance out of an aircraft is not a matter of "Hold my beer and watch this!" foolishness.

Two sections are devoted to introducing aerobatic maneuvers, splitting them into basic and advanced. Each maneuver is the subject of a short video—only just over a minute. In that time the maneuverer is shown graphically from a position outside the airplane—with the Aresti aerobatic key maneuver depiction (Aresti aerobatic shorthand is explained earlier)—then from a camera mounted on the horizontal stabilizer looking forward, followed by a view looking forward just above the pilot's head, and concluding with a view from the right wingtip looking toward the fuselage.

Our initial impression was that each maneuver was treated too lightly; however, as we watched each video again, we found that we stopped it repeatedly and were able to get much more of an understanding of the dynamics of each one.

The advanced maneuvers segment included the Lomcevak—which is loosely translated from the Czech as "headache"—and gave us one of the best displays of how the airplane tumbles end-over-end due to gyroscopic precession we've yet seen without actually doing one.

The final segment is a series of aerobatic maneuvers seen from inside the airplane with the camera placed just above the empty front seat. The scene can be panned through 360 degrees so we found ourselves stopping the action frequently and moving the camera to look around. We could see the stick deflection at any point of the maneuver and look outside in various directions. In our experience, a major part of the battle in learning aerobatics is figuring out where to look for reference points that let you know how each maneuver is progressing. By being able to stop the video and look in different directions, we felt it was possible for a student to learn where to look—wingtip, straight up, 45 degrees to one side and down, for example—to help make sense of a maneuver while flying it.

The course, not surprisingly, is an advertisement for Wagstaff's school, but we felt it was much more. We'd have loved to have seen this before we started our aerobatic training because it put a lot of valuable information that we had to look for from numerous sources in one place. We've found that we spent some time looking at the individual maneuver videos to pick up subtle points that we'll use in our own aerobatic flight.

We're looking forward to the additional videos in the aerobatic series as well as other topics Sporty's chooses to explore.

*Citabria on the back side of a loop—where it's surprisingly easy to stall the airplane, above. Catherine Cavagnaro doing a barrel roll in a Cessna 152 Aerobat, below.*


or three hours and your tolerance for maneuvering and Gs will have increased.

## AIRPLANES

We're fortunate to have a big selection of aerobatic airplanes at flight schools across the country. The cost varies directly with the power and capability of the airplane. The good news is, taking primary aerobatic instruction in the lower-power aerobatic airplanes is not only less expensive than the high-performance machines, it requires you to work harder to do the maneuvers well and, in our opinion, helps make you a better aerobatic pilot. It also prepares you well to handle upsets or unusual attitudes in the airplanes you ordinarily fly.

At the bottom end of the purpose-built aerobatic spectrum is the Cessna 150/152 Aerobat. It's a seriously beefed-up 150/152 with the same, small engine. It is among the best of all akro airplanes at snap rolls and spins.

Next in line is the Citabria and Decathlon line. All are tandem-seat tailwheel birds, and excellent tailwheel trainers. The Citabrias range in power from 115 to 160 HP and have fixed-pitch props. Decathlons have the same fuselage but a wing with a symmetrical airfoil, constant-speed prop and engines ranging from 150 to 210 HP.

We like the line because of the stick control and the pilot sitting in the center for rolling maneuvers. Some of the Citabrias and all of the Decathlons have inverted fuel and oil systems, so the engine continues to run when inverted. All but the 210-HP Xtreme Decathlon have heavy ailerons and a modest roll rate, so a pilot has to use some finesse to do the maneuvers well.

The 180-HP Great Lakes biplane has an inverted fuel and oil system and is flown solo from the rear seat. We like open-cockpit aerobatics and the Great Lakes does them reasonably well. 180 HP is only modest power for the high-drag airframe so energy management must be learned early.

At the top end of the aerobatic school trainer spectrum are the two-place Pitts Special S-2 series that took the aerobatic world by storm in the 1970s with their vertical capabilities and seemingly effortless ability to fly any maneuver and the Extra line of monoplanes that appeared in the 1990s and made the Pitts line look stodgy.

A not so tongue-in-cheek warning: Starting your aerobatic training in a Decathlon and finishing in one of the astonishingly nimble Extras may cause addiction to the sport.

While very few flight schools use former military aircraft as aerobatic trainers, they do exist—or you may own one and want to learn aerobatics or polish the skills you now possess. A number of aerobatic schools will train in the customer's airplane. For help finding training for antiques and warbirds we recommend contacting the IAC, Antique Airplane Association (AAA) (www.antiqueairfield.com) and the EAA's Warbirds of American (www.warbirds-eaa.org).

Finally, there are a lot of homebuilts that are aerobatic and many, notably in the Vans RV series, do the maneuvers well. We recommend reaching out to the type club for your type machine to find experienced, qualified instructors.

## COURSES

Our survey of aerobatic flight schools revealed that most offered a two-day, approximately five-hour, basic aerobatics course. The price ranged from $1700 in a Cessna Aerobat to $2595 in a Decathlon.

Several schools also offered more advanced courses with a total of eight to 10 hours in flight. Costs we saw ranged from $2500 to $5695 and were airplane dependent.

We particularly liked the approach taken by AeroDynamic Aviation (www.aerodynamicaviation.com) in the south San Francisco Bay Area. Chief instructor Jen Watson told us about their 10-hour course in either a Citabria 7KCAB or 150-HP Decathlon 8KCAB. It includes virtually all of the maneuvers the airplane is capable of performing and is tailored for the reasons the pilot wants to fly aerobatics, such as moving into competition, flying recreational aerobatics for pure enjoyment, general skill improvement or a combination of the above. In addition, once the checkout is complete, the pilot can rent the aircraft and fly solo aerobatics. That is not the case at all schools we surveyed.

All aerobatics are made up of three maneuvers: the loop, roll and snap roll. We think an aerobatics course should include the following (assuming the particular airplane is

*The Van's RV-8 is one of many homebuilt aircraft capable of aerobatics, above. When flying aerobatics you'll learn to put the controls to the stop—which may help you nail landings by slipping the airplane, below.*

approved for the maneuver): loops; aileron, slow, snap and barrel rolls; spins (with emphasis on the whys of spins, inadvertent entries and how to recover); Cuban 8; reverse Cuban 8; Immelmann turn; split S; Hammerhead turn; cloverleaf (four loops with a quarter roll going up or coming down); avalanche (loop with a snap roll on top); and inverted flight and turns. The training, in our opinion, should include recovery from botching each maneuver, upset recovery in general and how and when to unload the wing and roll the airplane upright.

Finally, we think that the school should have established a hard and fast "floor" altitude below which they will not do aerobatics. The FARs set 1500 feet AGL. We found only one school that would go that low when giving dual. The majority said that the minimum altitude for completing recovery from any maneuver was 3000 feet AGL. They generally started maneuvers at 4000 to 5000 feet AGL.

Catherine Cavagnaro, proprietor of Ace Aerobatic School (www.ace-aerobaticschool.com) in Suwannee, Tennessee, told us that for the first few spins with a student she wants to recover no lower than 4000 feet AGL. Cavagnaro, a mathematics professor at the University of the South, has done 60-turn spins in her school's 152 Aerobat—there are videos on the internet—and gives specialized two-hour spin courses.

She also installs extra inclinometers across the panel of the Aerobat to show students that the displacement of the "ball" in a spin is a function of where it is mounted on the airplane, so it will not give information for rudder input to recover from a spin (the little airplane in the turn coordinator, however, does show the direction of rotation of the spin).

Cavagnaro has her aerobatic student fly some maneuvers while looking at the instruments (but not under the hood) to show how the gyros react when they hit their limits and tumble.

## GETTING STARTED

Virtually none of the schools we surveyed said that they assigned homework for the student to complete before the first lesson. Patty Wagstaff told us that the most important thing is for the student to start aerobatic training with an open mind and a willingness to learn. "Aerobatics is about feel—sensing how the controls feel at all different speeds and G loadings."

Greg Koontz wants his students ready to learn "three-dimensional thinking."

We recommend that you show up for your first lesson current in the airplane you normally fly. This is not the time to spend money knocking the rust off of your basic skills. Nevertheless, plan on having the bad habits you've developed uncovered and corrected.

You are there for fun, so if things start coming at you too fast, say so, and slow down the pace. We like Jen Watson's approach at AeroDynamic. She installs a GoPro camera for video and audio of the lesson. Her comment to us was that the maneuvers can seem to flash by and it can be tough for students to understand what is going on and what control inputs are needed in a matter of a few seconds. Looking at the video while listening to the commentary seemed to help her students.

If you are nauseated, stop the lesson—you're not having fun and you're not learning. Take a break and come back to it after an hour or so.

## THE TAKEAWAY

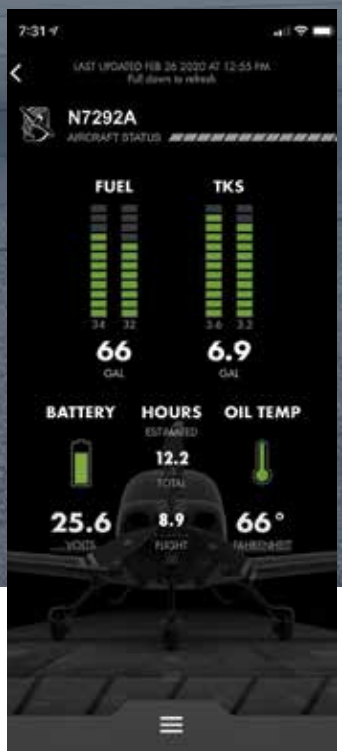
What should you come away with from an aerobatic course? You will not be a competition aerobatic pilot, but you'll have a solid start on it if that's your goal. You'll be able to do most of all the basic and some of the advanced aerobatic maneuvers reasonably well and safely—and you'll be able to recover from a botched maneuver. In our opinion, your level of pure airmanship will skyrocket.

Your landings will immediately improve. You'll no longer be worried about inadvertently stalling the airplane and you'll be willing to put the controls to the stop to make the airplane go where YOU want it to go. If you do have an upset or unusual attitude in a normal-category airplane, the chances are that you'll know what to do to recover and do it successfully.

You'll have broadened your aviation horizons and discovered some intensely fun flying—and, as Patty Wagstaff told us, you may find yourself getting into a very expensive hobby.

# 2020 Cirrus SR22T: Virtual Data Recording

*Cirrus IQ is an interactive datalogging suite that reports real-time flight data to a virtual cloud. Cirrus hopes it will make for safer ownership.*




**LARRY ANGLISANO**

We've been incrementally covering the Cirrus SR-series piston in *Aviation Consumer* since the beginning of Cirrus time, and strapping into the 2020 flagship SR22T Cirrus' Cliff Allen reminded me that it has been 23 years.

Today this million-dollar piston single continues to outsell any GA airplane by a wide margin, while brand loyalty and satisfaction soars.

But a hardened insurance market is putting more demands on Cirrus pilots, especially ones getting on in age and those with limited flying experience. NTSB wreck reports prove that some pilots in an SR22 might indeed be an insurance risk. But what if Cirrus helped tame that dragon by keeping an eye on this crowd through real-time data collection, sourced automatically every time the aircraft lands, and use it to build a customized remedial training curriculum? Meanwhile, software can keep an eye on engine and airframe vitals ahead of failures.

Much of that intelligence was already built in to the Cirrus for years. The Garmin G1000 Perspective+ isn't the only avionics suite capable of recording mega data.

All it took was a cellular transceiver to advance the interface to the next step, creating the modern-day flight data recorder by packeting the captured data and whisking it away to a digital cloud. Included is a snapshot of the pilot's stick and rudder and button-pushing technique. It's OK to say it—here's an airplane that rats you out.

## CIRRUS IQ

The SR22T GTS with Carbon package flown for this report was fully IQ-equipped, with a cellular datacom transceiver installed in the aft section of the airframe, and an accompanying smartphone app so the pilot can dial into the airplane remotely. The general concept of data reporting is old hat in the ground and sea transport industries, just as it is in the airlines.

Avionics data storage is hardly a new capability for Cirrus. From the early-gen Avidyne-equipped models, Cirrus, maintenance shops and the FAA/NTSB have used the captured data that's automatically burned to memory, and in the G1000 that's on a bezel-loaded SD card. Having access to trend data is a huge resource, especially for curtailing the troubleshooting and

*Cirrus IQ is far more than a gee-whiz smartphone app, shown in the main image. The app powers up the airplane from anywhere in the world through its onboard cellular transceiver, a device that transmits huge amounts of logged flight and system data to a virtual cloud after every landing.*

*The SR22T Perspective+ flight deck, top, is a Cirrus version of Garmin's G1000 NXi and has the stabilized approach feature as standard. Those are 12-inch displays. Standard is Whelen LED smart lighting, middle, and optional for 2020 is a four-blade Hartzell composite propeller.*

debugging process. Autopilot doing something strange? Turbine inlet temperature not looking quite right? Look at the fault log for clues. In a mature Cirrus IQ program, certain critical items could generate an alert to someone at Cirrus who's listening. Call it virtual tech support on steroids.

At the surface level, Cirrus IQ includes a clever smartphone app that enables pilots to wake up the airplane from anywhere there's cell coverage by dialing in from the app. Once connected and the aircraft powered up, you can view what Cirrus calls the "health status" of the airplane.

The stats page in the app shows how many gallons of fuel are onboard, how much TKS de-icing fluid is in the tank, the battery's voltage, the status of the oxygen supply, the oil temperature and aircraft flight time.

On the marketing side, Cirrus calls the owner/airplane virtual interaction another convenience in the so-called "Cirrus life," where an owner can keep tabs on whether the aircraft was fueled during its FBO stay and if it was put in the hangar (evident by the temperature of the oil), before they even arrive at the airplane.

## THE FUTURE

The real story with Cirrus IQ, especially if dialing in to the airplane isn't high on your list of important tasks (you probably like to watch the line person refueling your airplane), is where the technology can go in the future, rather than what it does now. The G1000 Perspective+ avionics already collect an impressive amount of data, and Cirrus hopes it will streamline the maintenance chores of ownership.

When the plane hits the shop floor, the trend data is retrieved, but Cirrus said by automatically uploading this data to a digital cloud every time the aircraft lands, it might help predict pending component failure. Maybe the data shows a pending alternator failure. AOG time might be reduced to nothing if Cirrus can send a replacement alternator to a service center ahead of time. I think the concept is grand and can help sell airplanes.

But it's not just about engine and accessory analysis. The stored mega flight data automatically streams back to the Garmin Pilot app during wireless data transfers via the Flight Stream 510 wireless hub. With it the entire flight can be recreated. Data is recorded in Cirrus Reports, a third-party web-based flight log and engine data analyzer powered by Aerocor.

Of course to effectively monitor the fleet of IQ-equipped airplanes (Cirrus said the system is not retrofittable at this time), I'd think the company needs a full-time technical staff dedicated to making practical use of the data. It's unclear when that will happen, or how much is happening now. At press time only a handful of 2020 models have been delivered, and the COVID-19 crisis has temporarily closed the Duluth, Minnesota, factory and the Vision Center in Tennessee. Also unclear—although clearly controversial—is precisely what Cirrus will do with the flight data that tags



*Cirrus nails cabin ergonomics, mimicking familiar high-end automotive interior design. Front seaters sit on 6-G seats and strap in with seat belt airbags, middle. The Cirrus' simple climate control system, bottom, is the best we've used in any piston single.*

along with the data stream.

I looked at an XLS spreadsheet of data that was downloaded from the demo airplane and saw an impressive level of data collection (refreshed every few seconds). Aside from engine and outside air temperatures there's pitch, roll, speed, altitude and how the aircraft tracked vertical and lateral guidance on an approach, to name a few. With this data, if you're consistently landing the airplane faster than Cirrus' iSOP prescribes (or not properly managing the energy on an instrument approach as another example), it's conceivable that the Cirrus training department will find out about it.

Cirrus even hinted that it can use the data to suggest remedial instruction. No matter how you feel about the idea of Big Brother watching, I think the aircraft owner should have the option to opt out of having the data automatically stored to anywhere other than a personal cloud storage. See the sidebar on page 16 for a training and insurance view on the IQ concept.

## AN IMPROVED G6

The 2020 SR22T is officially still a G6, and overall—especially from a performance standpoint—is mostly unchanged from when the G6 was introduced back in 2017. But there are more features, and Cirrus deserves kudos for always tweaking creature comforts and avionics capability.

The SR22T is powered by Continental's 315-HP twin turbocharged TSIO-550-K engine. In Cirrus tradition, there's no propeller control because of the fixed governor. For takeoff, feed it full throttle and lots of right rudder. Simple. With 50 percent flaps deployed, accelerate to 90 knots while slightly holding the nosewheel on and the airplane flies right off. Clean up the flaps and trim for the climb.

If you've flown a later-model Cirrus you'll know how the roll and pitch trim compression springs feel when the aircraft is out of trim. Don't trim it properly and you'll lose the battle to moderate to heavy control forces.

Real-world climb and cruise performance is respectable, if not fast. On a winter day the 10-hour-new airplane I flew for this report (loaded with just about every option available, plus four average-sized adults) hustled up to 9500 feet in 7 minutes at the 120-knot cruise climb speed. At 9500 feet it was making 180 knots true, lean of peak and burning 19.5 GPH.

But you don't buy a turbocharged Cirrus to mess around down low. The sweet spot for the SR22T is up high. Expect 200 knots at FL180 and 215 knots at FL250. Oxygen and TKS icing protection are standard on the SR22T.

The airplane can carry a reasonable load. With four average-sized adults and roughly 50 gallons of fuel (capacity is 93 gallons) it was more than 150 pounds below the 3600-pound max gross weight—plenty of room for bags and/or more fuel.

Not surprisingly, there have been some additions to the Perspective+ avionics suite, notably the stabilized approach advisory feature. Wander more than three-quarter-scale deflection laterally or vertically on an activated approach procedure and the system will alert you to correct. It also monitors the flap position and warns you (audibly and visually) if they aren't set correctly.

If you're flying an older Perspec-


*The SR22T GTS Carbon (or the Platinum and Rhodium appearance packages) add $34,900 to the $904,900 GTS base price.*

tive, you might appreciate some subtle conveniences in the latest Perspective+, including overlay of the heading bug on the moving map. It's a good predictive graphic that could keep you from turning the wrong way in unfamiliar terrain or controlled airspace.

There's also visual approach guidance, which builds an approach based on a 3-degree glidepath for most runways. It's loaded like an instrument approach, and the autopilot will fly it while you compare it to what your eyeballs see outside the airplane.

## WRAP IT UP

The SR22T GTS Carbon flown for this report was equipped with just about every option available except for the four-blade Hartzell composite propeller, which is $21,900. You can also highly customize the paint and interior of your new Cirrus, and those willing to pay the premium are rewarded with some of the finest paint work I've seen from an aircraft OEM. The Carbon appearance package on the demo airplane included premium leather seating and an exterior paint scheme that was inspired by high-end sports cars.

It also had the $59,900 TKS system, which is approved for flight into known icing, a $29,900 air conditioning system and a $15,900 Garmin satcomm system, which Cirrus calls Global Connect.

All in, the airplane was priced at $1,002,600, which included a five-year spinner-to-tail warranty. Cirrus said that incentives are available for owners who want to lease the airplane back as a Cirrus demo airplane for a specified period of time. During that time the airplane will be professionally operated by Cirrus corporate pilots, meticulously detailed and maintained by a Cirrus approved service center.

Contact www.cirrusaircraft.com.

## WILL IQ MAKE YOU LESS OF AN INSURANCE RISK?

**If you're serious about buying a new Cirrus, but have agita over the idea of the airplane ratting you out, you'll have to get over it. I was told that signing on the buyer's line means agreeing that Cirrus has rights to the data recorded in the avionics. That SD card is a useful tool in the Cirrus corporate tool belt—it's been using trend data to defend itself from lawsuits for years. Negligence could be pretty convincing when the data replay shows you attempted the approach to the mountain resort three times, descended below glideslope on each and fatally low on the last.**

**I asked Jon Doolittle, our resident insurance pro at Sutton James Aircraft Insurance in Connecticut, to weigh in on whether data-sharing capability can lower insurance rates, or at least make a high-risk pilot new to a million-dollar Cirrus more favorable. The reaction among the insurers he spoke to about the Cirrus IQ was deliberate, if not downright cautious, and at first all over the map as they thought about the idea.**

**"There is no room in the rates for this right now," was one, referring to the insurance market's attempts to increase rates toward profitability. One senior underwriter summed it up: "Is this data predictive? Will it help me tell the difference between a good risk and a bad one?" We think it might, especially if a Cirrus-approved instructor offers a favorable rating after analyzing the data. There's also the opportunity to use the data as a plan for recurrent training. If the data reveals your habit of flying your Cirrus to the flare 15 knots fast, some focused, data-driven training might avoid an inevitable smoking hole at the end of the runway.**

**Another insurer pointed to the fact that auto insurers have been using a much simpler technology that only gives them a few data points, and yet they continue to use it, so it must be working for them. "Each conversation that I had eventually followed a similar path: doubt, followed by a growing interest as they began to see some of the possibilities," Doolittle told us. Ultimately, most insurers he spoke with fell in line behind the idea. None said they would reduce rates as these new airplanes rolled off the line, but most of them felt that this was a way for general aviation to embrace similar technologies used by the airlines and corporates, and to move closer to their enviable safety records. It's tough to argue with Doolittle's takeaway.**

**"There may not be large premium discounts given for this new equipment in the near term, but it might make insurers more willing to take on a million-dollar single-engine airplane knowing that Big Brother is keeping an eye on things." —*Larry Anglisano***

# uAvionix echoUAT: Space-Saving, Wireless

*A compact, value-priced mandate-compliant ADS-B In and Out solution. It works with ForeFlight, but AHRS would make it better.*

*by Larry Anglisano*

In gliders, ultralights, gyrocopters and even some classic LSAs, some of the mainstream ADS-B Out/In combination solutions may not be practical from an installation (and cost) standpoint. In many aircraft, space is limited, on and off the panel.

uAvionix, the company that's had sizable success with the wingtip and tail-mounted skyBeacon/tailBeacon ADS-B solutions, has a diverse product line. Since the company has roots deep in the UAV market, the products are built for tight spaces.

One system is the echoUAT, a remotely mounted ADS-B Out and In transceiver that outputs on 978 MHz UAT, has a wireless interface for displaying traffic and weather on tablets running ForeFlight and other third-party apps, plus is designed to work in interfaces that have legacy transponders. The installation covers a variety of third-party models, including the Sandel STX-165, Garmin GTX 327, Apollo SL70 and King KT76A. It will even work with an old Narco unit, but make sure it's healthy before retaining it in the ADS-B interface. The uAvionix power transcoder keeps the ADS-B transmissions and transponder squawk codes synchronized so there's no need for a dedicated ADS-B control head.

The interface starts with the uAvionix SkyFYX antenna, which has a built-in WAAS GNSS sensor and RAIM processor. It's worthy for ADS-B position sourcing and meets FAA 91.227 performance criteria for rule airspace.

uAvionix said the receiver is resilient against jamming, spoofing and GPS range errors. It weighs 100 grams and measures 2.0 by 3.5 by 0.78 inches—small enough to mount in a wide variety of locations—and it's secured by four mounting screws.

The other piece of the interface is the echoUAT ADS-B receiver. It weighs 60 grams and measures 2.1 by 2.9 by 0.74 inches. In addition to the skyFYX receiver, it's also compatible with Garmin's GNS 430W/530W and GTN-series navigators, Avidyne IFD-series navigators, plus Dynon and GRT receivers, and has an RS-232 serial com interface.

The echoUAT transmits on the 978 MHz UAT frequency, so it's not a solution for flying above 18,000 feet. The ADS-B receiver is dual link (978 MHz and 1090 MHz) and has built-in Wi-Fi for broadcasting traffic and weather to a variety of apps, including ForeFlight, Seattle Avionics FlyQ, Wing X and FltPlan Go. It also works with a variety of experimental EFIS, including Dynon and GRT Avionics. There's no AHRS, so it can't be used to drive most synthetic vision utilities. Setup and configuration is accomplished with the uAvionix Echo App running on an iOS or Android phone or tablet.

The echoUAT is $999 and the SkyFYX receiver is $500. We spotted several retailers bundling the two for $1450. Neither component has an STC, so they're off-limits to Part 23 certified aircraft without FAA approval. Visit www.uavionix.com.

See other mandate-compliant solutions in the ADS-B Buyer's Guide starting on the next page.

*The skyFYX-EXT antenna, left, has built-in WAAS and drives the echoUAT ADS-B transceiver. The setup works with ForeFlight and others, but without AHRS, it won't display synthetic vision as shown.*

## MANDATE-COMPLIANT, PANEL ADS-B PRODUCTS

| PRODUCT | ADS-B SPECS | DISPLAY INTERFACES | PRICE | COMMENTS |
|---|---|---|---|---|
| APPAREO | | | | |
| STRATUS ES | 1090ES ADS-B TRANSPONDER | N/A | $2495 | Requires WAAS GPS input (Garmin, Avidyne). |
| STRATUS ESG | 1090ES ADS-B TRANSPONDER | N/A | $2995 | Has internal WAAS GPS, interfaces with select Stratus portable ADS-B receivers. |
| ASPEN AVIONICS | | | | |
| NGT-9000 | 1090ES ADS-B TRANSPONDER DUAL-BAND ADS-B IN | EVOLUTION MFD, SOME GARMIN AND AVIDYNE DISPLAYS | $2645 | L3 Avionics product sold by Aspen. $795 software unlock required to interface traffic/weather with Aspen display. |
| AVIDYNE | | | | |
| AXP340 | 1090ES ADS-B TRANSPONDER | N/A | $3995 | Partial plug-and-play with some existing BendixKing transponders. AXP322 is remote version. |
| AXP322 | 1090ES ADS-B TRANSPONDER | IFD NAVIGATORS | $3995 | Remote version of the AXP340. Tuned through the IFD-series navigators. |
| SKYTRAX100 | 978 UAT IN | ALL IFD NAVIGATORS | $2199 | Display compatibility with several third-party systems for ADS-B In, including Garmin GTX345, L3 Lynx 9000 Series, and FreeFlight RANGR UAT. |
| BENDIXKING | | | | |
| KT74 | 1090ES ADS-B TRANSPONDER | N/A | $2999 | Partial plug-and-play with KT76A/C, KT78A transponders, requires WAAS GPS input. |
| KGX130 | 978 UAT IN | IOS TABLET MFD TRAFFIC ONLY | $1489 | ADS-B In only, for use with 1090ES transponder. |
| KGX150 (G) | 978 UAT OUT, 978 UAT IN | IOS TABLET MFD TRAFFIC ONLY | $4069 | Has internal WAAS GPS. |
| KGX150 | 978 UAT OUT, 978 UAT IN | IOS TABLET MFD TRAFFIC ONLY | $3489 | Version without internal WAAS GPS. |
| | | | | |
| FREEFLIGHT SYSTEMS | | | | |
| FDL-978-RX | ADS-B IN | MFD, TABLETS | $3161 | Works with a Wi-Fi module for display on tablet computers and select panel displays. |
| FDL-978-RX/G | ADS-B IN | MFD, TABLETS | $3995 | Same as the FDL-978-RX, but with a built-in GPS. |
| FDL-978-XVR | 978 UAT OUT, 978 UAT IN | IOS TABLET MFD TRAFFIC | $3935 | Single-box solution that works with Garmin GNS430W/530W navigators, works with a Wi-Fi module for connecting to tablets. |
| FDL-978-XVR/G | 978 UAT OUT, 978 UAT IN | IOS TABLET MFD TRAFFIC | $4980 | Same as FDL-978-XVR but with internal WAAS GPS. |
| FDL-1090-TX | 1090ES ADS-B TRANSPONDER | N/A | $4495 | Remote control head/processor design, requires WAAS GPS input. |
| GARMIN | | | | |
| GTX330D W/ES | 1090ES ADS-B TRANSPONDER | N/A | $8637 | Diversity Mode S transponder with ADS-B Out when connected with an appropriate WAAS GPS. |

## MANDATE-COMPLIANT, PANEL ADS-B PRODUCTS (CONTINUED)

| PRODUCT | ADS-B SPECS | DISPLAY INTERFACES | PRICE | COMMENTS |
|---|---|---|---|---|
| GTX335 | 1090ES ADS-B TRANSPONDER | N/A | $2995 | Internal WAAS GPS. |
| GTX345 | 1090ES ADS-B TRANSPONDER | GTN750/650/G1000, G1000NXi, TABLETS, G500TXi, G600TXi | $4995 | Internal WAAS $5795, GTX345-R LRU priced the same and works on G1000 NXi, G2000, G3000, G5000. |
| GDL82 | 978 UAT OUT | N/A | $1795 | Designed to work with and connects to the existing Mode A/C transponder. |
| GDL84 | 978 UAT OUT, DUAL-BAND IN | IOS, ANDROID TABLETS | $3995* | Standalone ADS-B Out and In, wireless Bluetooth connectivity with Flight Stream 110/210. Requires Garmin Pilot, ForeFlight tablet app. *$4495 with Flight Stream 210 (built-in AHRS). |
| GDL84H | 978 UAT OUT, DUAL-BAND IN | IOS, ANDROID TABLETS | $3995* | Standalone ADS-B Out and In, wireless Bluetooth connectivity with Flight Stream 110/210. Requires Garmin Pilot, ForeFlight tablet app. *$4495 with Flight Stream 210 (built-in AHRS), version for helicopters. |
| GDL88 | 978 UAT OUT, DUAL-BAND IN | GNS530W/430W GTN750/650 G600/500/TXI/G3X *IOS/ANDROID | $3995 | Requires WAAS GPS input, tablet interface requires Flight Stream wireless Bluetooth module, Garmin Pilot or ForeFlight app. |
| GDL88-W | 978 UAT OUT, DUAL-BAND IN | GNS530W/430W GTN750/650 G600/500/TXI/G3X *IOS/ANDROID | $5143 | Has built-in WAAS GPS receiver, tablet interface requires Flight Stream wireless Bluetooth, Garmin Pilot or ForeFlight app. |
| GDL88-D | 978 UAT OUT, DUAL-BAND IN | GNS530W/430W GTN750/650 G600/500/TXI/G3X *IOS/ANDROID | $4495 | Diversity model (requires top and bottom antenna installation), requires WAAS GPS input, tablet interface requires Flight Stream wireless Bluetooth module, ForeFlight or Garmin Pilot app. |
| GDL88-WD | 978 UAT OUT, DUAL-BAND IN | GNS530W/430W GTN750/650 G600/500/TXI/G3X *IOS/ANDROID | $5643 | Has built-in WAAS GPS receiver, diversity (requires top and bottom antenna installation), tablet interface requires Flight Stream wireless Bluetooth module, ForeFlight or Garmin Pilot app. |
| GDL88-DH | 978 UAT OUT, DUAL-BAND IN | GNS530W/430W GTN750/650 G600/500/G3X *IOS/ANDROID | $5395 | Diversity and the version made for helicopters. |
| TRIG AVIONICS | | | | |
| TT31 | 1090ES ADS-B TRANSPONDER | N/A | $2225 | Stack-mounted, requires WAAS GPS input. |
| TT22 | 1090ES ADS-B TRANSPONDER | N/A | $1989 | Two-piece system, requires WAAS GPS input, compact. |
| UAVIONIX | | | | |
| SKYBEACON | 978 UAT OUT ONLY | N/A | $1849 | Wingtip mount with WAAS GPS, LED nav light, LED strobe light. TSO certified, STC for installation pending. |
| TAILBEACON | 978 UAT OUT ONLY | N/A | $1999 | Tail mount version with LED tail light. |
| TAILBEACONX | 1090ES ADS-B TRANSPONDER | AV-20, AV-30 | $2499 | Tail mount transponder, no lighting, pending cert. |

## SHOPPING TIPS ...

**Still not ADS-B Out equipped? While you're eyeballing the product list above, remember that our advice hasn't changed. If the aircraft needs an ADS-B Out installation, the first system to evaluate is the existing transponder. There's no sense in installing a standalone ADS-B system now only to spend a couple thousand dollars on a transponder install later. If there's any doubt, have your shop bench test the transponder to determine if it's a long-term keeper. If it's not, a transponder-based solution is likely the best choice. Although we're well past the January 2020 ADS-B mandate date, shops we talked with around the country are still backlogged with installations. We're also told that customers might expect priority scheduling if an ADS-B installation also includes other upgrades. Maybe it's time to pull the trigger on a PFD or GPS navigator upgrade, while also saving some money while the aircraft is opened up.**

PILOT SUPPLIES

# Youth Headsets: David Clark A Top Pick

*Fitting a small child with an aviation headset is a big experiment in patience. The DC H10-13Y offers good protection and room to grow.*

*by Mark and Greta Klebanoff*

Headsets for kids serve three purposes: They protect hearing, they keep kids entertained by providing a source of music and they allow kids to be part of the conversation in the airplane.

But there are several challenges, including finding a model with the right balance of comfort, features and durability. No, kids aren't easy on headsets, so they need to be rugged. There's also the concern about dropping a lot money on a set that a kid will grow out of.

Since *Aviation Consumer* hasn't looked at the market for youth headsets in a number of years, I scanned the market and collected a handful of samples to try in a piston single. Here's a field report.

## THE PROCESS

Our nine-year-old daughter Greta has been flying in our Cessna Cardinal RG since she was eight weeks old. We started her off with swimmer's ear putty, and then at around six months we moved her to children's hearing protectors. When she was around one year old and started watching videos, we bought her a child's headset made by Softcomm, and it lasted over eight years until the speakers failed. We were in the market for a new kid's headset.

Part of the process was talking with Sporty's, which suggested some models that have been popular sellers over the past few years. Our thanks to them for sending a few of the samples, including a Sigtronics S-20Y and a David Clark H10-13Y—both youth-purposed headsets. Since David Clark's supra-aural (on ear) Pro-X2 has a small footprint—and got high marks in the review in *Aviation Consumer's* October 2019 field report—we included it.

### CHECKLIST

- ⊕ You don't have to spend a lot of money to protect your kid's ears.
- ⊕ Most youth models can be upgraded to a full-sized headset as your child grows.
- ~ There is no guarantee that any set will be the right match for your kid. A return policy is imperative.

I also broke out the soldering gun and replaced the speakers in the old Softcomm model and tossed the set into the mix. As far as we can tell, this set has been discontinued, but there might be some on the used market. We tried to experiment with an in-ear model, but Greta wanted no part of sticking buds in her ears. We suspect that will be the case with many younger kids—just as it is for some adults.

We evaluated audio quality in part by playing SXM's E Street Radio through the aircraft's audio system, and Greta could not distinguish a difference between the headsets in the group. Listening to Greta talk through the intercom, I could not distinguish any difference between the audio quality of the microphones—they were all quite good. The passive headsets had a volume control on the ear cup, and the Pro-X2 had separate volume controls for each earpiece on the control box so adjusting the volume to suit a kid is easy, although younger kids might struggle with the chore.

As for styling, while younger children might be attracted to a headset because of its color (and the Softcomm's purple ear cups were a major selling point for Greta when she was a year old), at age 9 she couldn't care

*That's Greta wearing the David Clark H10-13Y, street-priced at $319. It has a rugged and flexible mic boom and weighs 16.5 ounces. She's also demonstrating the correct way to secure a child in the cabin.*

less about color, other than to call them "green," "purple" and "blue" during testing.

We took to the skies in our Cardinal and tried each set for roughly 30 minutes, paying attention to fit, finish and features.

## HOW YOU MIGHT CHOOSE

The most important thing to consider is that the best kid's headset isn't necessarily the one with the best performance or features. Instead, it is the one that your kid is willing to wear for hours at a time. So as with all headsets, getting return privileges is really important.

The second most important thing to consider is that little kids are perfectly happy watching the same 30-minute episode of Mickey Mouse Clubhouse over and over for an entire four-hour flight, but after the second time around the grown-ups are ready to open the doors and jump out (don't ask us how I know that). It's also a distraction to what at times should be a sterile cockpit.

Unfortunately, an important feature that these headsets do not necessarily have is a separate input for headset-dedicated audio so the grown-ups don't have to listen to it. Still, a dedicated isolated input allows the child to continue on the airplane's intercom.

Of course, the most effective way to do that is with an intercom or audio panel that has multiple entertainment inputs that you can dedicate to your child's intercom station. But for our purposes here, we would want a kid's headset that has its own auxiliary music input jack.

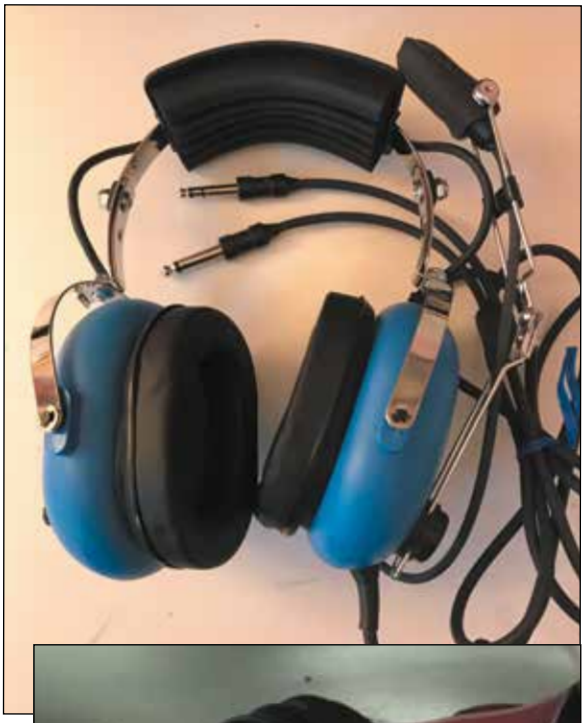
There's Bluetooth, too, of course, but in reality we consider that as secondary because many kids' audio devices don't have wireless capability. Further, the only Bluetooth-equipped model in the evaluation pool was the Clark Pro-X2 (which isn't really a youth-purposed set). Only the Softcomm had a wired 3.5-mm input jack. The Pilot USA PA-1151ACG (we didn't fly with it) is also so equipped.

Herewith are Greta's impressions and my observations during flight trials.

## DAVID CLARK H10-13Y

This was Greta's favorite headset because it was the most comfortable of the three full enclosure models, perhaps due to its generously thick double-foam head pad. It weighs 16.5 ounces. It's a passive headset, of course, but in kid language, yes, it blocked the most noise of the three. The tech specs say it has an NRR (noise reduction rating) of 23 dB. Not surprisingly it was the most expensive.

*The Sigtronics S-20Y, shown here, comes with two different sized headbands, but the set didn't impress when it came to comfort. It got decent marks for its adjustable mic boom.*



The microphone boom is a flexible one-piece design that's easy to manipulate into almost any position, and it holds. You know what happens with loose-fitting mic booms that drop below the lips—forget about hearing the kid's mic audio. Unless they have, well, loud mouths. But that's another reason for an intercom with passenger volume and squelch controls. It's nice to have as much control over the audio in the cabin as possible.

The mono-only H10-13Y has a single volume control, a well-performing M-7A amplified electret microphone and gel-filled ear seals.

Street priced around $320, the TSO'd H10-13Y is the most expensive of the over-ear models but there's a saving grace: The set can be converted to a full-sized model with a $30 upgrade kit.

Visit www.davidclark.com.

## SIGTRONICS S-20Y

This headset, street priced at around $160, came with a large and small headband. While this offers flexibility for a growing kid, we found that the large headband was a better fit for Greta so we used it in our trials. Saying that, this headset was Greta's least favorite because almost as soon as she put it on she complained of it pressing against her jawbone. Try as we might, we couldn't find an adjustment that helped. After a while, Greta complained that the set became very uncomfortable.

As for performance, it did a good job of blocking noise, but not quite as good as the other two. The articulated microphone boom, although not as flexible as the David Clark's, was easy to position. It's worth noting that changing the microphone windscreen requires removing the microphone from the boom. We did not attempt to do that, but it did not appear to be a difficult job.

The S-20Y has a 24-dB NRR and weighs 12.4 ounces, so it is no

*The kid finally fell asleep, and the headset stayed in place. That's the Pilot Cadet pictured top and middle. We like the flex mic boom and the standard aux audio input. The on-ear, small-footprint David Clark Pro-X2, bottom images, was promising, but didn't work well on Greta. The speakers in the domes need to be positioned perfectly over the ear canal, which may be challenging for small ears.*

surprise that it performed nearly as well as the David Clark H10-13Y. The M-80 amplified electret microphone can be rotated for use on the left or right ear cup.

The ear cups are made of ABS plastic and the hardware is chrome plated and hardened steel, which makes the set durable. Sigtronics has what it calls a "stop-break" high-flex cable, and the company says the electronics are RFI and EMI free. Speaking of hardware, it comes with everything needed to convert it to an adult set. It has a three-year warranty.

Visit www.sigtronics.com.

## PILOT USA CADET

The company says it was the first to design an aviation headset for children and the $130 PA-1151-series Cadet is for kids between two and 12 years old. Since our evaluation was in the middle of the COVID-19 pandemic, we couldn't get our hands on a fresh set for this review. But we've used them before with reasonably good results. The company was available to talk with us—a good sign when it comes to promised support.

The set is in line with the other passive models in the group, with a 24-dB NRR and weighing 11.9 ounces. It has foam ear seals, and the set has 5-foot audio cables and a noise-canceling electret microphone. We like that it has a flexible microphone boom, which is sized smaller for kids.

The boom can be upgraded to a larger one (as can the headband) by sending it back to the company. This leaves room to grow. The set is available with pink ear cups or a version with a blue and red combination.

What we really like is the standard 3.5-mm aux input jack piping in audio. It has dual volume controls (one on each ear cup) and mono/stereo capability. Visit www.pilot-usa.com.

## CAN ADULT SETS WORK?

The answer is a cautious maybe. Sporty's told us that the hugely popular Bose A20 is sometimes a successful choice for kids given their comfort and light weight. If you have them, simply try them. I'd have a hard time coughing up $1000 for a kid's headset that will not be used that often. Of course, it's also an adult headset, so if you consider it as a long-term purchase then maybe the cost isn't so bad. My wife has been using an in-the-ear Lightspeed Mach 1 for a long time, and we still have a few replacement earpieces, although they're getting hard to find for this long-discontinued model. Last sum-

mer I asked Greta if she wanted to try it out, but she was grossed out by the idea of stuffing something in her ears. I tried again when researching this report, but she still was not interested, and couldn't even be bribed to do it.

I was surprised when Greta wasn't blown away by the well-performing David Clark Pro-X2. She agreed it was the lightest headset we tested, but did not think it was more comfortable than the H10-13Y. I was most surprised that she thought the H10-13Y filtered airplane noise better than the Pro-X2. I confirmed that she had powered it on correctly, and we tried several adjustments to the fit, but no matter how we tried, she still preferred the passive David Clark. This doesn't mean the Pro-X2 can't work for some kids.

## THE TAKEAWAY

Our thanks to Sporty's for providing some of the samples for the review. It's hard to say anything definitive after trying these headsets for roughly a half-hour each on one kid, but if there is a general lesson it is to try them on in the store if you can (and even better in the airplane) and look for generous return privileges. It's possible that the one your kid liked during a tradeshow demo will turn out to become uncomfortable after wearing them in the airplane.

Additionally, based on personal experience I'd strongly recommend a headset that allows the child to listen to something other than the music the grown-ups pipe through the aircraft audio system. That way the rest of us don't have to listen to kiddie videos at the youngest ages or the head-pounding rock-and-roll I'm sure my daughter will like when she's a few years older.

While the most expensive of the youth models, the $320 David Clark H10-13Y was a favorite, plus it can be easily upgraded to a full-sized model. If it had an aux audio input it would be a grand-slam winner. If aux audio is a must-have feature, we say try the $130 Pilot Cadet. If a particular model has worked for your kid, we want to hear about it.

*Contributor Mark Klebanoff and his daughter Greta are Cessna Cardinal RG owners based in Ohio.*

AIRCRAFT UPKEEP

# Sanitizing The Cabin? Go Easy On The Screens

*It only takes seconds to cause a $1000 factory repair when cleaning avionics. Garmin's latest service alert has guidance worth following.*

*Larry Anglisano*

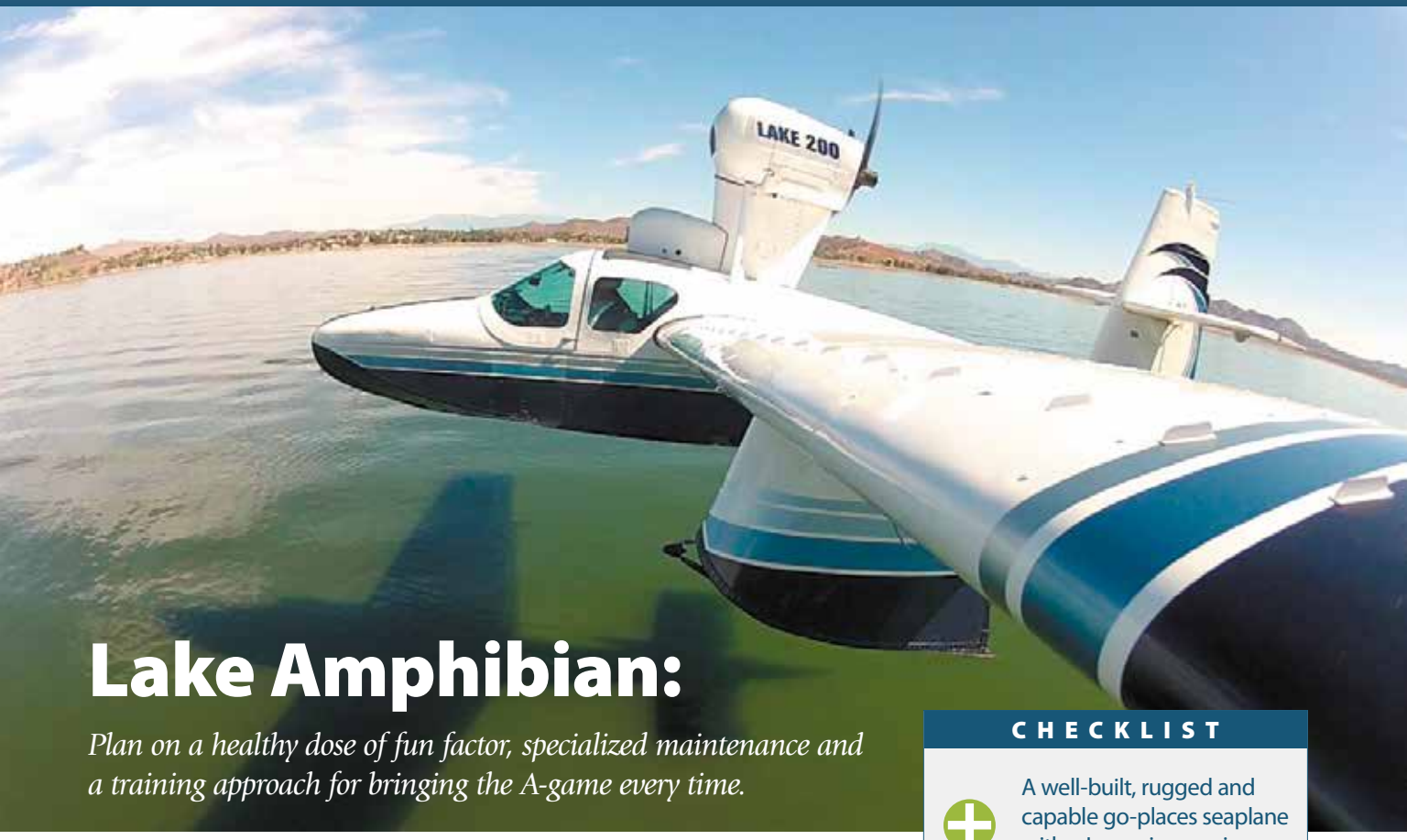
Don't overthink the chore of wiping down the cabin. The favorite store-brand disinfecting wipes work well for cleaning control yokes, throttle handles and anything else germy hands touch—except display screens. Hit those with a heavy-duty cleaner and you might as well pull the whole unit from the panel and ship it away for a flat-rate display lens replacement.

Garmin expects to see more of these repairs given the awareness of reducing germs so it's issued Service Advisory 2051, which is guidance for cleaning and disinfecting its products, while hopefully reducing the spread of disease in the cockpit. Not following the guidance could void the product warranty.

Most of Garmin's guidance is obvious, but worth reviewing. To be clear, cleansers containing ammonia will trash the anti-reflective coating on display lenses used on a wide variety of screens. Preferred is an ammonia-free solution of 70 percent (up to 91 percent) isopropyl alcohol and a lint-free cloth. No paper towels or shop rags—they're too coarse and will scratch the lens. Optical solutions might work, but use with caution.

Our go-to has been the iCloth cleaning wipes, shown in the photo below. You can find a 100-pack count on Amazon for $20. They work well with eyeglasses, tablets and phones. Sporty's also sells the Zip Dry Towel screen cleaning wipes.

You want to be careful with any solution when cleaning around bezel knobs and buttons. Use a damp cloth with a mild (non-bleach) cleaning solution and don't get any solution inside the bezel. The buttons might gum up and you could introduce moisture to the contacts, which is a repair waiting to happen.




# Lake Amphibian:

*Plan on a healthy dose of fun factor, specialized maintenance and a training approach for bringing the A-game every time.*

**CHECKLIST**

- ✚ A well-built, rugged and capable go-places seaplane with a Lycoming engine.
- ✚ Maintenance support—including parts availability—remains good.
- ~ This is not a forgiving seaplane for pilots who don't take training seriously.

Get a taste of water flying and we pretty much guarantee you'll consider your own seaplane. Got a runway to put it on and a hangar to stuff it into? The venerable Lake Amphibian should be on the list for shopping. Yes, there are some modern alternatives in the experimental and LSA market, including the well-rounded Sea Rey.

Still, the Lake single-engine pusher has been a staple in the amphib world as far back as 1957, and while owners love them unconditionally, you'll never hear boasts of impressive cruise speeds. Just the same, we know folks who travel in Lake amphibs and yes, they fly them IFR. These can be reliable go-places machines.

But don't underestimate the challenges of maintaining an engine set way up in the air, and hard-nosed insurance requirements for serious initial and recurrent training, especially in the current hardened insurance market.

## THE LITTLE FLYING BOAT

The Lake series was originally developed by Grumman, the maker of now classic multi-engine flying boats, as a potential entry in the civilian market after World War II. The company built a prototype but decided not to go any further, letting two of its engineers—Dave Thrust and Herb Lindblad—take the design, which Grumman called the Tadpole, and start building it in 1948 in Sanford, Maine, as the three-seat 150-HP Colonial C-1 Skimmer.

Flash forward ten years when they made it a four-seater with a 180-HP engine and called it the C-2. In 1960, they extended the bow and wings and dubbed it the Lake LA-4. About 250 Skimmers and LA-4s were built before production ended in 1962. There were some company changes that saw the manufacturing side become a separate entity, called Aerofab, from the sales and service side, an arrangement that continued until production stopped. The type certificate was acquired by Consolidated Aeronautics (Conaer) in 1963, which moved its corporate headquarters to Texas but kept the factory in Maine.

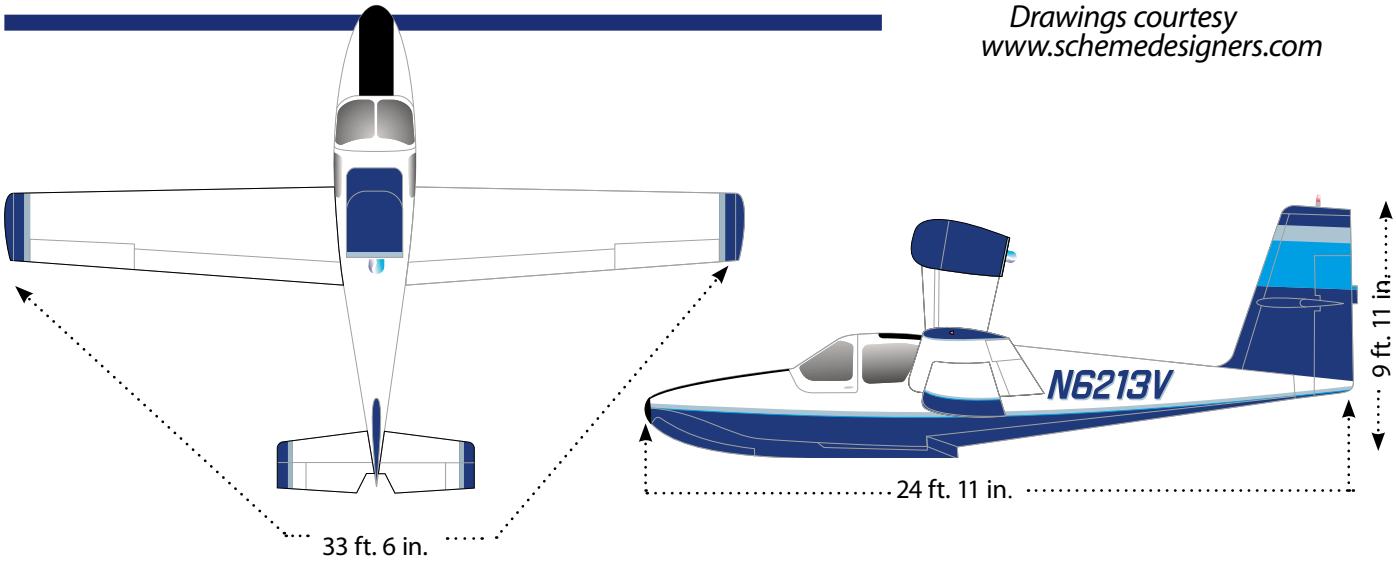
*The Lake Amphib shines on the water because its hull is inherently stable and strong and its CG is low.*

The Lake Buccaneer (LA-4-200) was born in 1970 when Conaer put a 200-HP fuel-injected Lycoming on the LA-4. Over the years, a few turbo models were

*A 200-HP Lycoming makes the LA-4-200 a reasonably good performer on the water, but pay close attention to loading.*

# LAKE AMPHIBIAN

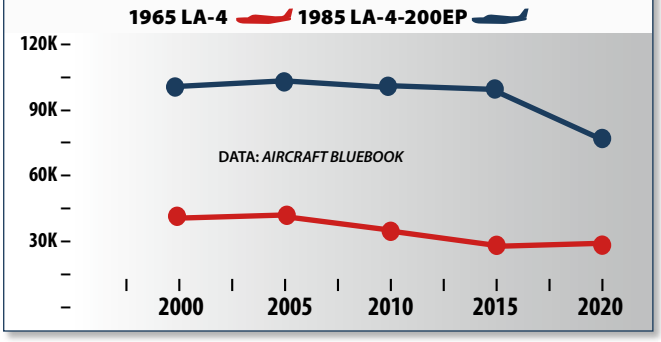
*Drawings courtesy www.schemedesigners.com*




## LAKE AMPHIBIAN SELECT MODEL HISTORY

| MODEL YEAR | ENGINE | TBO | OVERHAUL | FUEL | USEFUL LOAD | CRUISE | TYPICAL RETAIL |
|---|---|---|---|---|---|---|---|
| 1957 C-1 | 150-HP LYCOMING O-320-A2A | 2000 | $20,000 | 30 | 700 LBS | 117 KTS | ±$14,000 |
| 1958 C2-IV | 180-HP LYCOMING O-360-A1A | 2000 | $23,000 | 30 | 830 LBS | 117 KTS | ±$19,000 |
| 1965 LA-4 | 180-HP LYCOMING 0-360-A1A | 2000 | $23,000 | 40 | 845 LBS | 114 KTS | ±$29,000 |
| 1979 LA-4-200 | 200-HP LYCOMING O-360-A1B | 2000 | $24,000 | 40/54 | 1135 LBS | 130 KTS | ±$62,000 |
| 1985 LA-4-200EP | 200-HP LYCOMING 0-360-A1B | 2000 | $24,000 | 40/54 | 1030 LBS | 127 KTS | ±$81,000 |
| 1995 LA-250 | 250-HP LYCOMING IO-540-CFB5 | 2000 | $30,000 | 76/90 | 1290 LBS | 122 KTS | ± $240,000 |
| 1995 LA-270 | 270-HP LYCOMING TIO-540-AA1AD | 1800 | $60,000 | 76/90 | 1065 LBS | 155 KTS | ±$265,000 |
| 1997 LA-250 SEAFURY | 250-HP LYCOMING IO-540-CFB5 | 2000 | $30,000 | 76/90 | 1290 LBS | 122 KTS | ±$325,000 |
| 1997 LA-270 TURBO SEAFURY | 270-HP LYCOMING TIO-540-AA1AD | 1800 | $60,000 | 76/90 | 1065 LBS | 155 KTS | ±$345,000 |

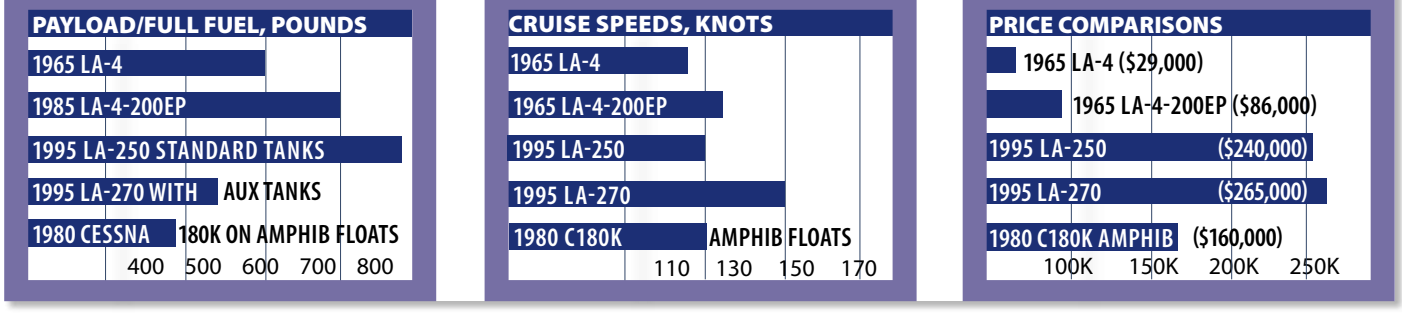
## RESALE VALUES




## SELECT RECENT ADs

| | |
|---|---|
| **AD 2013-08-14** | HORIZONTAL STABILIZER ATTACHMENT FITTING INSPECTION |
| **AD 2002-21-05** | INSPECTION OF UPPER AND LOWER WING SPAR DOUBLERS |
| **AD 2000-10-22** | WING SPAR REINFORCEMENT KIT INSTALLATION |
| **AD 86-23-05** | MODIFICATION OF FUEL SHUTOFF VALVE MOUNTING PLATE |
| **AD 76-12-11** | INSPECTION OF FUEL FILTER HOUSING FOR CORROSION |

## SELECT MODEL COMPARISONS



*That's an LA-4-200 Buccaneer standing rugged on its mains in the top photo. There's a reasonable amount of panel space for modern avionics. The Lake panel at the bottom has a Garmin GNS 430 and BendixKing Silver Crown avionics, including a KFC150 autopilot system.*

made and at least one non-amphibian water-only model.

In 1979, Armand Rivard, an independent Lake distributor, bought the company and moved it to Kissimmee, Florida. He introduced the LA-4-200EP.

To reduce cooling drag and noise, it had a new nacelle and its prop shaft extended five inches farther aft. It also had "batwing" fillets at the wing/fuselage junction to improve low-speed handling by eliminating eddies and turbulence that disrupted prop performance.

Rivard also introduced the Renegade in 1979, a six-seat version with a 250-HP IO-540, a beefed-up structure, a rear cabin door and larger tail. It easily outperforms its predecessors and is even more stable on the water.

Beginning in 1981, the Lakes all got more grease fittings, polychromate primer, an improved canopy and more rust-resistant cabin vents.

A turbo version of the Renegade became available in the late 1980s through an STC, so technically it is a mod done by the factory. Its Lycoming TIO-540 is rated at 270 HP.

In 1991, the company started making the Seafury, a Renegade with lift rings, survival equipment, a custom tool kit, aux power receptacle and stainless steel brake discs, plus extra corrosion-proofing in an extra coat of chromate primer inside and out and a ceramic coating on the steel parts.

Finally, the company developed the Seawolf. It's a Seafury modified for the military as a patrol, reconnaissance and special ops aircraft that has proved popular on the international market.

The company had a hiccup when Armand Rivard decided to try retirement. His son, Bruce, had no interest in taking over the factory so, in 2002, Armand sold his end to a Maryland FBO operator, Wadi Rahim, who called the company Global Amphibians and shut down the Maine factory.

Only two of its veterans moved to a new factory he opened in Florida, according to Bruce Rivard. Things did not work out and before long, his father got the company back. Bruce handled North American sales and service out of New Hampshire (go to www.teamlake.com), including finding good used Lakes and upgrading them for sale with a warranty. Production slowed to special orders only and, in the last few years, stopped.

Prices have a very wide range from $14,000 average retail for a good C-1 Skimmer (a pretty rare find; fewer than 25 were built) to nearly $350,000 for a 1997 LA-270 Turbo Seafury, according to the *Aircraft Bluebook*.

Moreover, prices have been stable, but as the market goes into a COVID-19 holding pattern, that might change. The 200EP is praised as the best compromise among Lakes between cost and performance. The *Bluebook* shows a 1983 LA-4-200EP at $75,000 average.

## PERFORMANCE, HANDLING

"Instant vacation" is what one owner has called the Lake experience, and Lake fans say there is

nothing else short of homebuilts and a couple of exotics (anybody know of a clean Seabee?) that lets them fly as easily into a remote lake or stretch of river as on or off a runway. Of course, Icon aircraft is trying to make these operations a reality for more people with its A5 LSA amphib. Still, as with most machines that float and fly, that flexibility comes at a price in cruise efficiency. For certain the Lake, for its power, does not go fast.

A 200-HP Buccaneer performs on a par with a 150-HP landplane—one owner said that he flight plans his Lake at the same speed he does an older Cessna 172. Owners reported that book cruise numbers were not realistic. They reported cruise speeds in the 105- to 115-knot range with fuel consumption of about 10 GPH. A Renegade cruises at about 122 knots and one owner told us he burns 13.5 to 14 GPH. The turbo version shines up high with cruise speeds closer to 150 knots. That's pretty respectable, in our estimation.

The EP does better than the Buccaneer, cruising at about 120 knots. It has hull strakes that improve water handling and allow the hull to break free of the water at a lower speed—45 knots instead of 53 for a Buccaneer (50 knots with a batwing mod).

A Renegade pilot told us the EP is the best of the lot, is almost as fast as the Renegade, has better short-field performance and is more economical.

Company specs for the 250-HP Lake list cruise as 132 knots true at 6000 feet with 75 percent power with a 900-FPM best rate of climb at sea level. The turbo version, with its 270 HP, has the same performance except up high, where true airspeed is said to reach 155 knots. The EP's best rate of climb is 980 FPM, according to company specs, and the Buccaneer's rate is optimistically listed as 1200 FPM. An LA-4 with 180 HP is said by the book to climb at 1000 FPM.

Owners have complained that a heavily loaded Buccaneer (it can carry about 1000 pounds) is sluggish during climb. Some call it a two-place airplane with baggage or a four-place airplane with reduced fuel and bags. Lake's 180-HP models should be avoided by buyers looking to carry a lot. At gross weight, climb will be around 500 to 600 FPM and cruise will be about 105 knots, max.

*Optional cargo doors make loading and climbing in and out of a Lake pretty easy. Once inside, seating is utilitarian and not exactly cavernous, but outside visibility is quite good. Storage in the baggage tunnel, bottom, is minimal.*

The Lake's tendency to nose down when power is added and to rise when power is reduced because the engine is mounted high above the CG is one of the many reasons that a thorough initial checkout is in order, in our opinion. Owners reported that it's wise to practice low-altitude go-arounds because of the nose-down pitch with power—one said, "Botch the power input on a bounced landing, while low and slow, and you're going to break it—probably badly." The high rate of accidents following bounced water landings we saw in the NTSB reports seemed to confirm this owner's concern.

In flight, the airplane is agile by seaplane standards. The ailerons are light but the rudder is a bit heavy, and flying the Lake well requires good rudder skills in the air and on the water. Stalls occur just above 42 knots or so, indicated. Recovery is gentle and predictable.


*You have to do some climbing to work on a Lake's engine. Once perched, access is good from the front and sides of the cowling.*

Having a Lake is not so much about its cross-country flying abilities, which are fine for shorter flights up to 300 miles or so. It is all about getting yourself right into the countryside for whatever fun you have in mind. The airplane shines on the water, owners say, because its hull is inherently stable and strong and its CG is low. On a hot day, it takes precise technique to get a heavily loaded Lake on step for takeoff, especially the older models without hull strakes, available as a mod to reinforce the hull and reduce water drag. They also add more stability in turns.

Nevertheless, the airplane does not have a deep-V hull, as does a Seabee, so it does not handle rough water well. In addition, it is a short-bodied flying boat, making it at risk for porpoising. It is a descendant of the Grumman line of flying boats and shorter than the smallest of the marque, the Widgeon, which was not at all tolerant of errors in pitch attitude on landing—many Widgeons were lost to porpoising events.

The Lake accident records are loaded with water mishaps. Catching a sponson in the water landing in a gusty crosswind can cause an upset and a lot of damage. Bad landings or rough water can end with the Lake trying to play submarine. In anything but calm air, docking is a major challenge because the mid-level wing and its sponson may not clear the deck.

On the ground, the Lake pilot needs a knack for steering with differential braking because the plane does not have a steerable nosewheel.

It's absolutely essential—and required for insurance coverage—to get Lake-specific training. The active and, in our opinion, effective Lake Amphibian Flyers Club can provide a list of highly qualified Lake CFIs (not to mention knowledgeable Lake shops, an absolute must for any prebuy evaluation).

Lake Aircraft's Team Lake in Gilford, New Hampshire, offers a one-day introductory ground school that opens the new Lake owner's eyes to what the airplane can do and what to be careful about, not the least of which is the lack of a gear-warning horn and the potential for landing gear up on a runway (not so bad) or gear down on the water (extremely bad). Also note there's no squat switch to prevent a gear collapse on the ground if you accidentally flip up the gear switch. Lake also offers a five-day ground and dual course. Be prepared to work hard.

## LOADING, COMFORT

Useful load in real life averages about 800 pounds for a 180-HP Lake without an IFR panel. It's about 950 pounds for the 200-HP version and 1200 pounds for the Renegade.

Lakes tend to be nose heavy, a trait that is aggravated by the fact that the CG moves forward as the airplane is loaded. We're told that a Lake EP, as one example, has a rear CG when empty and requires forward ballast when flying solo. Adding passengers eliminates the rearward CG, but can result in a forward CG and the need for aft ballast. The point to remember is the Lake is not a load-and-go airplane. Having the CG beyond limits for a gross-weight takeoff with a lot of pine trees beyond the beach is asking for trouble.

Only mods and the Renegade airframe have a back seat/cargo hatch, so expect to utter a few expletives when it's time to get in all your fishing and camping gear through one of the two front clamshell doors.

Fuel capacities range from 30 gallons in the Skimmers and 40 gallons in the old LA-4s. The Buc-

caneer had a 55-gallon option and the Renegade carries 90. There's a mod available for the older Lakes to put fuel in the sponsons, adding 14 gallons total.

There is elbow room up front, a bit less in the back. In older models, the hard seats adjust only fore and aft and the cabin is noisy. The EP model has more foam and customized features, and the Renegade has the nicest interior of all; its price reflects it.

There's no muffler cuff ahead of the firewall to collect heat for the cabin. Through 1973, Lakes used Janitrol gasoline heaters, for which an AD required complete overhauls every two years. Lake switched to Southwind heaters in 1974, but they had only on and off switches so the choice was cook or freeze. Lake went back to improved Janitrols in 1983.

## SYSTEMS, MAINTENANCE

For a complex airplane that performs in a tough environment, the Lake has amazingly few ADs.

Hydraulics are used extensively on the Lake, running trim, flaps and gear all through one accumulator, pump and reservoir. All the actuator static and dynamic seals are plain O-rings and the failure of one will incapacitate the whole system. "You may replenish the supply from your squirt bottle and position the gear, flaps and trim," an owner told us, "but the flaps and trim will bleed to the trail positions."

All seaplanes leak. It's a fact of life. The hull of the Lake is broken into compartments with drains at the bottom of each—accessible when the airplane is on land. To purge the bilge water when on the water, there is an electric pump located near the step. So long as the airplane is sitting level, owners tell us that it will get rid of most of the water in about five minutes.

The problem comes if the airplane is parked, on its gear, in the water with the tail low (not unusual). The pump will not remove the water in the aft portion of the hull and can lead to an aft CG on takeoff. From owner feedback and a review of accident records, we think this has led to at least one accident. The bilge pump should be run after the airplane is sitting level in the water with the gear up.

A big issue, of course, is corrosion. During the 1960s, the 180-HP Lakes had no zinc chromate treatment and some didn't have alodine. Check for a faint gold tint to the aluminum on the interior structure of any pre-1970s airplane. No tint, no alodine.

The absence of green zinc chromate primer makes the airplane susceptible to corrosion, especially if it flies into saltwater, and a bad case of corrosion can render a Lake worthless. Starting in the 1970s, all Buccaneers were alodined and zinc chromated; starting in 1983, an additional polychromate primer was applied.

Corrosion isn't the only water worry. Lakes take a beating from waves and junk in the water that can lead to dings and dents. Gravel, rocks and sand strip paint and gouge the hull. Watch for it. Also check for internal damage at bulkhead station 97, a stress point for the hull. It was beefed up beginning with 1982 models.

There have been a few complaints about the turbo 270 model. Oil dripping from the crankcase breather tube makes a mess of the tail.

A search of Service Difficulty Reports going back a decade did not yield a lot of them. About a third involved cracks in structural components; there was no distinguishable pattern among the remainder. But at this point the majority of aircraft have been fixed. If the wing spar AD has been accomplished, it's no longer a concern. Depending on the method used to comply with the tail AD, these can be one-time fixes with no recurring actions needed, or may need recurring inspections at annual, 50-hour or 850-hour intervals.

Owners were unanimous in telling us that having a prepurchase examination done by a shop that knows the ins and outs of Lakes is essential. One owner passed along his experience of taking his prospective purchase to a shop that had little Lake experience and that gave him a thumbs up on the airplane. He said that he bought the airplane for $80,000 and then spent $200,000 getting all of the undetected problems fixed.

## MODS, OWNER GROUP

Bruce Rivard's Team Lake in Gilford, New Hampshire, is praised for good

## LAKE AMPHIBIAN ACCIDENTS: OTHER

Our review of the 100 most recent Lake Amphibian accidents revealed amazingly few of the type of accidents we see in airplanes that cannot take off from water after landing on it. There were no gear-up land landings at all—and there were no reported times that the gear wouldn't extend.

The absence of gear-up embarrassments caused us to wonder whether amphibian pilots become so attuned to making sure that the Firestones are where they should be because the penalty for getting it wrong on a water landing is—distressingly often—death.

There was one gear-down water landing accident. Fortunately, the solo pilot was able to get out from the submerged, inverted airplane.

The other excellent news was that there were only two VFR-into-IMC crashes and only two pilots lost control and hit something during a go-around. Both are well less than half the number we expect to see.

There were 19 reports of engine stoppages or power loss—eight of which could not be explained or duplicated afterward. The ones that could be explained were because of errors in maintenance or failure to conduct maintenance.

Once Lake pilots decided to get their airplanes wet, the accident picture changed.

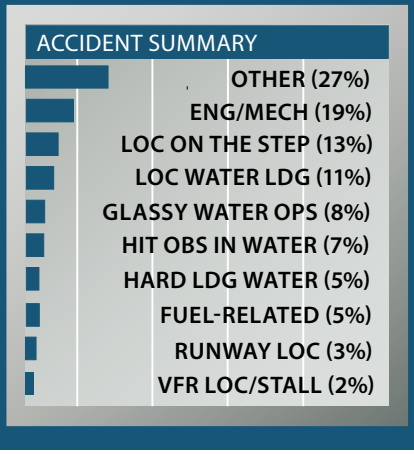
A combination of rough water, big waves or boat wakes with a Lake scooting along on the step on takeoff, just after landing or while high-speed taxiing seemed to be a recipe for trouble. A number of accelerating Lakes were thrown into the air at below takeoff speed due to rough water and the pilot then stuck a wing into the water, porpoised or hit the water well nose down.

We have sometimes felt that making a turn while on the step has the equilibrium of a beach ball balanced on a pin. About a quarter of the on-the-step accidents involved making a turn and putting a wing into the water. In some cases the inconvenient arrival of a boat wake tipped the fragile step taxi balance equation, and the flying boat.

While there were only three runway loss of control (LOC) landings—we credit the wide gear—there were 13 water LOC landing events and five water landings hard enough to cause structural damage.

Seaplanes are intolerant of any amount of yaw on a water touchdown and the penalty is often that the airplane flips. The Lake is no exception. One pilot bounced twice and didn't keep the airplane straight on the third touchdown. Another attempted what we consider to be one of the more challenging types of landings in a seaplane—crosswind on a river. He didn't cancel out the yaw and, as with the previous example, flipped the airplane.

Glassy water presents its own set of challenges because the human eye cannot focus on the surface so it's impossible to know precisely how high you are. Not surprisingly, it led to eight Lake crashes (although Lakes are no more susceptible than other seaplanes), one while the pilot was turning from base to final and hit the water. One pilot took off from calm water and then decided to fly low. At cruise speed he started a turn and put a wingtip into the water. The resulting cartwheel killed all aboard.




service and accessibility. The company will help source a used Lake and even handle the transaction, including the prepurchase evaluation. It also has inventory of its own.

The bona fide Lake type club is the Lake Amphibian Club (www.lakeamphibclub.com), and it was formed by key members of the previous Lake Amphibian Club. The LAC renewed the traditional four-day fly-in and safety seminar (LakeFest) and publishes the Lake Club news.

Popular mods are wing fillets or "batwings" to smooth airflow into the pusher prop and improve low-speed performance. Vortex generators also make for better slow-speed handling.

There's a "hydro-booster" kit to fit strakes on the hull to stiffen it and allow for easier water liftoffs. A cargo door is a boon for getting into the back seats and the cargo area. Adding hatch holders is a good idea and turning the sponsons into auxiliary tanks is another option. We highly recommend the LAC for guidance.

### MARKET SCAN

Published *Aircraft Bluebook* average retail values are mostly unchanged since we looked at these aircraft a few years ago. Fetching the most money are late-model Lakes, of course. A 1997 LA-270 turbocharged Seafury has an average retail price of $365,000, according to *Bluebook*. Its Lycoming TIO-540-AA1AD engine has an average overhaul cost of $60,000 and an 1800-hour TBO.

A quick browse of the respected controller.com sales website revealed a few Lakes for sale. At the time we prepared this report (mid-April 2020) there was a 1989 LA-270 Renegade listed for $239,000. Always operated in fresh water, the airplane was used to set a 21,700-foot altitude record for light seaplanes. It had no damage history and a touch over 1000 hours on the airframe and engine since new, a fresh annual inspection and King Silver Crown avionics.

There was a 1986 LA-4/200EP Buccaneer for $134,900, with a fresh factory remanufactured engine and overhauled prop. It had an IFR panel with Garmin GNS 430W, a digital engine monitor, aux fuel tanks, cargo door, Vortex generators, a Humminbird depth finder, Whelan wingtip

*The pylon-configured engine on a Lake means exaggerated pitch changes when changing power settings. Bring your A-game for every landing. The landing gear, middle, is beefy, but there's no squat switch or warning horn. Aileron feel is light, but the rudder is heavy, bottom.*

strobes, plus updated leather seating. In our estimation, this is one of the better Buccaneers with a fair asking price.

Still out of the budget? We spotted a 1980 LA-4-200 with roughly 3000 hours on the airframe and 1000 on the engine since a major overhaul. It's an IFR aircraft with a Garmin GNS 530W navigator, plus Vortex generators, aux fuel tank and an interior that was spiffed up back in 2007 and paint that dates back to 1992. It has an annual inspection due in August. The aircraft is priced at $69,900, but we'd budget more given the upcoming annual inspection.

We can't stress enough the importance of conducting a thorough prepurchase evaluation by someone who knows these seaplanes well.

## FIELD REPORTS

I have owned Lake amphibians for over 25 years. This includes a Buccaneer, an EP and my current Lake 250, which I have owned for more than 15 years.

I first soloed an aircraft on my 16th birthday and will be receiving my Wright Brothers master pilot award for 50 years of flying without an accident or incident in the near future.

I decided a long time ago that the Lake Amphibian was the aircraft for me. It is fun to fly, has great ramp appeal and can take you to places where no other aircraft can reasonably go.

I have the aircraft maintained by Amphibians Plus, with Harry and Christopher Shannon taking good care of our major maintenance including a recent engine overhaul, removing the vacuum system and installing the Garmin G5 and Aspen PFD.

Having an aircraft that can land at a cottage in northern Michigan or travel to a major airport for a business meeting is just fantastic. I may spend more than average maintaining my Lake 250 but feel the money is well spent for an aircraft that can make fantasy flights come true.

Trips to Alaska and the Bahamas are on the agenda, as well as attending the regular Lake Amphibian fly-in events, especially the event at Killarney, Ontario, which is a wonderful gathering of Lake Amphibians and the interesting people who fly them.

The Lake Flyers Club is a good source of information for anyone operating or thinking about purchasing a Lake Amphibian. I could go on with much more, but it looks like it's a nice day and the water is getting soft this spring here in Michigan. I think I'll go fly my Lake Amphibian.


Clifford Maine
via email

The Lake has been a big part of my life (46 years and counting) and I got my private ticket in a Lake

The Aviation Consumer

## Used Lakes

*(continued from page 31)*

Buccaneer back in 1974. I still enjoy the airplane and fly as much as I can. It's more for fun now, but I do mix business with pleasure.

Team Lake in Gilford, New Hampshire, is very active in the top-end of the used Lake market and our company is available to assist with finding the best airplane for anyone interested in water flying.

*Lake amphibian ownership has its privileges, as pictured here. But you'll pay for expert maintenance and low-time airframes. Save some time and money for good training, too.*

For over 45 years Team Lake has watched and studied the used Lake market, which is shrinking as more Lake amphibians are exported and end up in remote parts of the world and seem to disappear.

Recently I visited with a couple of Lake owners from remote locations—one from Africa and another from Australia (the real outback)—and they both had the same thing to say about their Lakes.

"You must not be flying much, I haven't heard from you in a long time," I said. The response? "I use the heck out of it, and it just keeps on going," was the answer. That's an accurate testimonial for a good, well-maintained Lake.

We work hard to assist buyers in every aspect of Lake ownership, including flight training and aircraft support. This includes working with the insurance company and conducting maintenance at our facility in New Hampshire.

As for parts supply, they still come directly from REVO in Kissimmee, Florida. It supplies parts direct as well as to service centers including Lake Central in Canada and Amphibians Plus in Florida. I think both do a great job maintaining the fleet.

Worth mentioning is that Armand Rivard is actively discussing the sale of the Lake type certificate and related assets.

I only wish I had new Lakes to sell, but maybe soon!

Bruce Rivard (Team Lake, LLC)
Gilford, New Hampshire

## MOONEY M20J/201

It's time for a fresh look at the used Mooney M20J/201 market in an upcoming Used Aircraft Guide, especially given Mooney's recent shutdowns. We want to know what it's like to own these popular Mooney models, how much they cost to operate, maintain and insure and what they're like to fly. If you'd like your Mooney to appear in the magazine, send us any photographs (full-size, **high-resolution**) you'd like to share to the email below. We welcome information on mods, support organizations or any other comments. Send correspondence on the Mooney by Sept. 10, 2020, to:

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