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The consumer resource for pilots and aircraft owners

The Aviation Consumer®

The Refurb Game

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The Aviation Consumer

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Full Disclosure

An acquaintance recently mentioned that she was considering going back to school for an advanced degree in business, but that she didn't want to take a required marketing class. She said that, to her, marketing was teaching people how to lie. Her remark caused me to recall some of the less-than-scrupulous techniques used to sell aviation products and how buyers have been burned. I've been thinking about all of this as I consider a developing concern with the marketing of the fine Zaon portable collision system.

At the truly ugly end of the spectrum, I've written about the whoppers that are regularly told by sellers of used airplanes—the ratio of sleaze to truth one runs across when in the market for a gently used airplane can be depressing. Ever since the Montgolfiers' balloons, the three basic rules of buying a used aircraft remain invariable—never, ever buy unseen; have your maintenance technician do a careful pre-purchase examination and be willing to walk away.

When it comes to new airplanes and products, I expect a high standard of truth and disclosure—after all, we're talking products where a defect or failure to disclose can be fatal. Yet, even in a business as mature and highly regulated as is general aviation, the truth isn't always told. That keeps this magazine busy.

In a competitive market, the pressure to over claim or simply not fully disclose information can be overwhelming. For example, few pilots know that the cruise performance section of a POH is not FAA-approved as are some other sections. Plus, prior to 1976—back in the days of the Owner's Manual—nothing in the book was FAA-approved. It is up to the manufacturer to decide what to put in for cruise speeds. For a time in the 1960s and 1970s, there were a few manufacturers that were putting out cruise numbers that ranged from optimistic to poor fiction.

Exposure of the practice in this magazine in the 1970s was, in my opinion, one of the reasons most cleaned up their act. It's one reason *Aviation Consumer* is careful to check performance numbers when reviewing an airplane.

It seems to work—I've been reviewing airplanes for this magazine for more than 15 years. My experience is that the published numbers are usually accurate to within one or two percent.

A major part of my job is to expose foolish claims and call out companies that cross ethical lines in advertising. As we go to press, I'm concerned that some of the very reputable, major aviation retailers may be doing just that.

Recently, I have received word from readers that Zaon, maker of portable collision avoidance products that have received good reviews in this magazine, has closed its doors. Larry Anglisano, our avionics guru, and I have been trying to find out if Zaon is out of business. All of our efforts to reach Zaon have failed

I hope whatever is going on with Zaon is just temporary.

If Zaon is gone, it means a buyer is out of luck if she or he needs warranty or customer support. However, in my perusal of retailers that sell the Zaon XRX, I've noticed that every one has marked down the price at least 30 percent—yet none of them have mentioned that there is currently no customer or warranty support.

That's simply wrong.

While a prospective buyer may decide that it's worth the crapshoot of buying a unit that costs more than $1000 and will have no warranty or customer support because the price has been so heavily discounted, she or he should know a substantial bet is being made. It's too early to tell if Zaon is gone, but anyone selling its products should be disclosing the highly increased risk of buying. —*Rick Durden*

Avionics Market Outlook

After reading Larry Anglisano's article in the November issue about the conundrum in which avionics manufacturers find themselves, I couldn't agree more with your conclusions. As an aircraft owner with a mix of newer and older avionics, I am one of those potential customers who are sitting on the fence, trying to decide how best to stretch my aircraft dollars. The debacle called ADS-B isn't helping the situation, either.

I don't see value in combo boxes like the KNS770 or GTN750. Mobile platforms have nearly all the map functionality in a much larger display, making them easier to use in flight. A good nav/comm and approach-approved GPS is all that is needed after that. (*Mobile platforms do not meet the upcoming ADS-B out equipment requirement, and without ADS-B output, ground uplinked traffic performance is limited. —Ed.*)

I have King radios now and had Garmin radios in my previous bird. Both are very good, though I think I favor King for a basic nav/comm. What I'd really like to see from King is a replacement radio for the KS-155-165—while nearly bulletproof, they are technologically long in the tooth, big and heavy when compared to the competition. If King can do to the nav/comm what it did to the transponder, I'd be inclined to open up the wallet.

Chris Nichols
Via email

Zaon

Do you have any information regarding the current status of Zaon Flight Systems? I've been trying to reach someone at their headquarters in Addison, Texas, without success. Last week, telephone calls were met with a "mailbox full" message. This week it's "the call did not go through."

As I live close by, I drove to Zaon's home office. The door was locked during business hours. These are signs of a business closing its doors.

I'd hate to think that, as I have one of the MRX devices that I very much like, and I've been thinking of upgrading to the XRX model. I contacted Sporty's and was told that Zaon had closed down. I don't think it's appropriate for a retailer to sell equipment when they know the manufacturer is out of business without disclosing it to potential buyers.

I'll hang on to my MRX, but it appears there will be no further firmware updates as this required factory assistance. I'm bummed—I liked Zaon.

Mike Ward
Via email

We cannot confirm that Zaon is out of business, although we have been unable to reach any of our usual contacts with the company and, at press time, the telephone numbers do not work. We are aware that at least two distributors are selling Zaon equipment at a highly discounted rate—their advertising does not disclose that the company appears to be out of business. In our opinion, that's unethical.

We strongly recommend that any prospective purchaser of Zaon equipment confirm the company is still in business before making a purchase. –Ed.

Fuel in the Nose

I just read Rick Durden's November issue column regarding fuel tanks in the nose of new airplanes. I've owned a Piper J-3, which has a nose fuel tank. Fifteen years ago, for convoluted reasons, I stalled and spun it to the ground even though I had over 7000 hours of flying time and several type ratings, including warbirds and the Ford Trimotor.

Of course, the nose-first impact resulted in fire. My next memory is EMTs preparing to transport me to the hospital. I was given a 50/50 chance of surviving my burns, including 30 percent full-thickness burns. The point is, as Rick says, don't crash in a plane with fuel in front of the cockpit. I was lucky. I suspect many others have not been.

John Rolls
Via email

AKRO FOR UNDER $100K

As an aerobatic airplane owner since 2004, I was interested in your October issue article about used aerobatic aircraft. I've owned a Super Decathlon and Extra EA-300.

Don't be scared of wood spar Citabrias and Decathlons, but do a good pre-buy. The folks at the manufacturer also have excellent descriptions and pictures to guide mechanics. Pitts' wings have always been made of wood and hold up beautifully.

Check metal-wing Citabrias and Decathlons carefully for fuel leaks from cracks in the tops of the tanks—the fix is expensive. Make sure any 180- or 200-HP Lycoming-powered airplane with a constant-speed prop has a "B" model prop hub or face expensive, recurring inspections. Definitely join the International Aerobatic Club, as it has tremendous technical and historical info on all akro airplanes.

Farrell Woods
Via email

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Fun is flying in an open cockpit. With the SAM LS you can, by easily removing the canopy, left. Rear-seaters will need to wear a flight helmet due to wind blast.

AIRCRAFT FLIGHT TRIAL

SAM Aircraft LS: Modern Nostalgia

In a seen-one, seen-all light sport market, the SAM LS stands out for its retro 1930s charm, high-quality build and pleasant flying manners.

by Larry Anglisano

The light sport market is supposed to be about simple, affordable and fun flying, isn't it? While a handful of models come close to hitting that mark, including versions from Legend Aircraft, Cub Crafters and now, SAM Aircraft with the SAM LS, CC and STOL models, it's the affordability thing that always seems to get in the way.

At $131,000 delivered, the SAM LS may not represent the affordability that the light sport market once promised. On the other hand, owners who want a modern aircraft that has the retro appeal of vintage trainers from the Golden Years might tolerate the SAM's price tag. Want to save some dough? You can build your own.

RETRO VISION

SAM Aircraft was established in Canada in 2009 by Thierry Zibi, an enthusiastic pilot who set out to design a modern and comfortable sport plane that has the charm and interesting ramp appeal of a model from the 1930s. In our view, he's succeeded because in the two days the aircraft spent on our ramp, it attracted huge amounts of attention. Some thought it was a replica of a Ryan STA (from which it was inspired) while others called it a Varga Kachina. Whatever, it's an attention-getter.

Savvy folks will recognize that the model we flew was equipped with a tricycle landing gear—an odd configuration for its retro-wannabe fuselage. Still, the aircraft can be ordered with a tail wheel.

THREE WINGS

Zibi's other goal was to produce an aircraft that can be personalized. Aside from the choice of landing gear, the aircraft can be ordered with one of three different wing configurations. This includes the SAM CC (25-foot wingspan), the SAM LS (28-foot wingspan) and the SAM STOL (32 foot wingspan).

No matter what wing or landing gear you choose, the tail and the wing center section is common between all models. The aircraft we flew was the LS model, with a wing that's stressed for up to 4G of flight load at the 1320-pound gross weight (the maximum takeoff weight allowed under LSA certification). Basic empty weight is 830 pounds, leaving 490 pounds of useful load.

A few words on certification; the SAM is currently undergoing LSA certification and is already certified in Canada under AULA (Advanced Ultralight Aircraft) regulations. As we explain in the sidebar on page 5, the aircraft is available as an amateur-built kit.

The tandem-configured aircraft can be ordered and flown with or without a canopy that's easily removed and reinstalled with three quick-release hinges. Once inside, cabin width at the shoulders is 26 inches and has adjustable leather seats and armrests. There's little if any room for storage once seated—not even a small camera bag, as we learned (unless you place it on the empty rear seat). There is, however, a small storage area just forward of the windshield that's accessed on the outside of the aircraft. It can accommodate up to 35 pounds of stuff. There's also an optional aft baggage area, at a weight premium.

While the aircraft is intended to be flown from the front seat, flying from the rear seat is easily accomplished (we tried it). The rear position has a throttle, stick and rudder pedals, but passenger brakes are optional. Both seats are adjustable over a long range—the SAM accommodates pilots of all sizes.

Still, we were barely able to access the rudder pedals in the back because they're oddly surrounded by narrow tunnels that are crudely fabricated from unfinished sheet metal. Passengers with larger feet will struggle to fit them in the tunnels (size 10

The Dynon Skyview system with 10-inch display, synthetic vision, electronic engine monitoring and integrated transponder dominates the SAM's front cockpit, top photo. That's a Garmin comm radio underneath it. The pilot and passenger are treated to leather seating and leather arm rests, middle photo. Pack light. Expect to fit a backpack in the forward baggage area, bottom.

hiking boots barely fit). Zibi basically said the sheet metal surrounding the pedals are intended to keep the passengers' feet from kicking the pilot in the rear end. Fair enough.

Zibi also said that rear-seaters will be subjected to sizable amounts of wind blast, so without a second windshield, open-canopy flying in the back will require a helmet and goggles—just like the old days.

RUGGED EFFICIENCY

Front and rear-seaters are protected by a 4130 steel protection cage that absorbs structural loads while attaching to the aircraft's aluminum bulkheads. All control surfaces are aluminum, and the fuselage is made of 2024 and 6061 aluminum. Wing load limits have been tested to 5.2 positive and negative G.

Each wing contains an 11-gallon fuel tank, for a total of 19 gallons of usable fuel. The tanks are in the central portion of the wing, just aft of the solid, riveted main spar. Managing the fuel is simple—select left, right or off on the fuel selector that's located on the right side of the cockpit. The fuel return line is connected to the left fuel tank, so if you plan on using all of the available fuel, you'll want to spend the right tank first. Otherwise, burn from the left tank first, to make room for returned fuel.

The dual-carburetor, 100-HP Rotax 912S that was installed in the SL we flew has an engine-driven fuel pump and an electric boost pump. Zibi said the aircraft can accommodate a Lycoming IO-233 engine, but that will require a shorter engine mount than the longer frame that's used to support the Rotax. In fact, the Rotax engine mount extends the engine well forward of the firewall, creating a maintenance-friendly environment. It also keeps the CG forward. The cowling is so large, distant onlookers think it's holding a rotary engine, instead of a small Rotax. There's that nostalgia factor, again.

For certain, the Rotax 912S is efficient, burning 4.5 GPH at 5200 RPM in cruise, yielding a 480-mile range. That's a tad over four hours' endurance—probably more time than most would want to spend in the airplane in one sitting—despite the reasonably comfortable leather seating.

Maximum cruise speed is 125 MPH—a number we didn't see—because the aircraft we flew had a temporary Sensenich wood propeller, subbing for the original that was out for repair. The standard propeller is a ground-adjustable 70-inch diameter composite Sensenich that, according

CHECKLIST

- ✚ Unlike some other LSAs, the SAM LS has plenty of ramp appeal.
- ✚ Controls are nicely balanced and the aircraft has no bad habits.
- ~ In a crowded market, $131,000 muddies the buying decision.

The 100-HP Rotax 912S, top photo, seems to make for a good power-to-weight ratio for the SAM's 1320-pound maximum gross weight. The hinged canopy, middle photo, can accommodate occupants as tall as 6-foot, 6-inches. A large horizontal stabilizer, bottom photo, requires diligent trimming.

to SAM, climbs the LS at 800 FPM. That's a respectable number.

AVIONICS

The front cockpit of the SAM looks nothing like any you would find in a 1930s monoplane. Slide into the leather seat and you're greeted by a 10-inch Dynon Skyview color display with integrated GPS, terrain alerting, advanced engine monitoring—including fuel quantity—and an integrated transponder. There's also synthetic vision. The SAM we flew had Garmin's SL40 communications radio that's been replaced by the new GTR-series radios.

To back up all of the glass, there's analog airspeed, altimeter, vertical speed and turn coordinator instruments, plus a wet compass. A 7-inch Dynon Skyview display for the rear cockpit is optional.

FLYING IT

You board the SAM forward of the left wing's inboard leading edge, with a step that hangs off the fuselage. Once on the wing walk, simply step onto the seat and plop down—fighter style.

The front and rear seats have three-point harnesses (we expected a four-point design). When going flying with the canopy installed, grab hold of it and lower it down into place to catch the securing hooks and a latch that locks into place. This latch can be opened from the inside and outside of the airplane. To open the canopy, lift the latch and pull the canopy backward one inch, then tilt it from left to right. The canopy provides good visibility while seated in the front or in the back of the aircraft.

For those not familiar with starting a carbureted Rotax, it's easy. Electric fuel pump on, throttle at idle, choke on and turn the key. With the Rotax running, the cabin is surprisingly quiet, with little airframe vibration other than a brief canopy shake until the Rotax comes to smooth idle power. As part of the standard avionics package, a two-place intercom is installed.

The SAM is a tall aircraft, resulting in good visibility during taxi, while the nosewheel steering provides plenty of feedback once you get up to taxi speed. Before takeoff, there's not much to do with the Rotax other than throttle up to 4000 RPM and perform a magneto check.

The takeoff is accomplished with the Fowler electric wing flaps retracted. The 100-HP Rotax quickly brings the aircraft to its 65 MPH rotation speed, resulting in a 350-foot ground roll. Zibi says the aircraft doesn't have limitations for taking off and landing on turf runways.

If trimmed properly, the aircraft is easy to coax off the runway, although you'll need to immediately lower the nose to keep it flying (it's no Cirrus). Once it is flying, the drill is to transition to a 75 MPH cruise climb, where you'll immediately enjoy the aircraft's pleasant flying characteristics.

The flight controls for pitch and roll consists of a combination of bellcrank and pushrods, while the rudder is controlled via cable. There are considerable amounts of pitch stability and control authority, thanks to a large and efficient horizontal stabilizer, with 20 degrees of travel in both directions. That said, the aircraft lets you know when it's out of trim in the pitch axis,

with noticeably heavy forces on the control stick that are corrected with the electric pitch trim system (commanded by a rocker switch on the control stick).

The roll stability in this aircraft is pleasant. We were throwing the SAM around the sky at steep bank angles and experienced little adverse yaw, even with feet off the rudder pedals. Stick forces in roll are light. The Frise ailerons keep the aircraft tracking precisely where you put it, even with hands off of the controls. The aerodynamically balanced vertical stabilizer extends to the bottom of the fuselage, providing decent yaw control.

Stall speed in a clean configuration is 49 MPH and 42 MPH with full flaps (35 degrees). The SAM exhibited no bad habits in a stall, with a noticeable buffeting followed by a drop of the nose, and no wing drop. The aircraft quickly flies out of the stall when you pitch it down. There's more stall warning with the flaps down, with a buffet occurring a few MPH prior to full stall and again, no wing drop. The aircraft had acceptable roll control in a fully stalled condition.

At the time of this review, the aircraft was being tested for its spin characteristics (we opted out of being part of that testing). Zibi told us the vertical stabilizer design is paying off, based on the spin testing to date.

"The aircraft really doesn't spin but instead, it's more of a spiral, rather than an aggravated stall. We're finding that even in a cross-controlled situation, the aircraft is easily recovered," Zibi said. Since the aircraft is currently certified in the AULA category, aerobatic maneuvers are off limits.

For landing, you're shooting for a 90 MPH initial flap extension speed. In a descent out of 3000 feet, the aircraft hustled toward Vne (155 MPH), so you'll need to be vigilant in minding pitch and power control going downhill and for slowing to flap speed. Maneuvering speed at maximum gross weight is 90 MPH. Ideally, you'll want an approach speed somewhere in the 70 MPH range. We flew the SAM in relatively calm surface winds, but the operating handbook lists the maximum demonstrated crosswind velocity as 13 knots, based on a 1232-pound gross weight. Manage the airspeed and flare properly, and a tricycle gear-equipped SAM will reward you with a nice landing. Misread the sight picture—as we did on the first landing—and the main telescopic gear is rugged enough to sustain drop-ons, as long as the aircraft is tracking straight.

FUN TO FLY

That can be said of many sport planes that are on the market and it's true of the SAM, too. Buyers might be attracted to the heavy-duty structure, leather seating, removable canopy and the other creature comforts that the SAM brings to the table. The reality check, however, is the $131,000 price tag and the pending LSA certification. With full fuel, a well-equipped SAM has a useful load in the 500-pound range, when obeying the 1320-pound gross weight limit. Depending on the mission, this might be fine for some. For others, maybe not.

As for the price, we think it's fair, based on equipment, build quality and the SAM's cool factor. On the other hand, its price point is shared with other respectable and interesting factory-new models, including the closed-cowl Legend Cub and Lightning LS-1, to name a couple.

CONTACT

SAM Aircraft
514-445-6409
www.sam-aircraft.com

BUILD YOUR OWN SAM FROM A KIT

One way to increase the useful load, while taking advantage of that 1450-pound design gross weight, is to build a SAM from an available kit. In the experimental category, that leaves close to 650 pounds of useful load, with the tanks full of fuel.

The standard kit, which starts at $29,000, includes CNC pre-drilled and pre-bent components with matched holes, the 4130 welded protection cage, complete landing gear parts and Matco brakes, electric flap and trim motors, plus the fuel tanks and senders. It also includes the interior (fabric seats) and modular canopy.

For an additional $13,000, you can get quickbuild kits. These are wings and a fuselage that are 75 percent assembled. This includes a fully assembled tailcone, bulkheads and aft skins, plus ready-to-install flaps and ailerons. All welds are completed at the factory. The cowling, wingtips, wheelpants and empennage tips are molded fiberglass. SAM also offers an optional Rotax installation kit.

Zibi says that the assembly of the standard kit requires roughly 900 hours to complete. The quickbuild kit with 75-percent completed wings and fuselage reduces the completion time to 500 hours.

None of the kits, of course, include engine, instruments, avionics and paint, although they can be purchased directly from SAM.

Zibi said that the company will provide unlimited builder assistance. Since the company only employs two full-time workers plus a number of experienced aeronautical engineers, you can likely expect personalized attention. SAM Aircraft is based on the Lachute airport (CSE4) in Quebec.

The Refurb Game: It's Gaining Momentum

With new aircraft prices becoming increasingly unaffordable, the industry is responding with a vigorous refurb market.

by Paul Bertorelli

Owning an airplane requires a certain suspension of the economic rules that govern normal people, but on the whole, the airplane industry operates under an even more perverse logic: As sales soften, it raises unit prices, perhaps chasing away those buyers on the margins who might have been toying with pulling the trigger to buy a new airplane.

The result? Nearly everyone in the industry recognizes that the rise in new aircraft prices is all but dooming the industry and while they're waiting for the nebulous solution to this problem, something curious and not unexpected has happened. A lively industry in refurbishing older airplanes to like-new standards has sprung up and it appears to be gaining market traction. The trend finds action in everything from modest piston singles, to turboprop twins to small business jets. Even the banks are beginning to notice.

While there is a move afoot to rein in new aircraft prices by streamlining FAR Part 23, those economies are several years in the future. Meanwhile, buyers who don't want tattered airframes but either can't afford or refuse to buy new, increasingly have a third choice: refurbished to like new.

HOW BAD?

The chart at right from the General Aviation Manufacturers Association shows the troublesome trend that would-be buyers sense and aircraft sellers confront everyday. The relevant portion of the graph lies to the right of 2008. Unit production of general aviation aircraft in the U.S. plummeted from 3079 in 2008, to a little over half that in 2012. The bottom of the market was in 2010. Piston production dropped from 945 in 2008 to 415 in 2010 and it hasn't recovered much since.

Yet just before 2008, as the orange line shows, billings continued to rise as production dropped and although billings declined too, they've since flattened out and may be rising again, even as demand remains stunted.

The detailed data behind the graph tells the story. Aircraft prices have risen briskly with falling demand as manufacturers have struggled to stay afloat. Some examples: In 2008, the venerable Cessna 172 retailed for $283,500; a 2014 model will sell for $415,000, an increase of 47 percent and almost a tripling of price since the model was reintroduced in 1997. The popular 182 has increased less, but still rose 8 percent during the 2008 to 2012 period. The 206 escalated by 11 percent.

Not to pick on Cessna, other manufacturers—Diamond, Piper and Cirrus—have posted similar price increases that, in some cases, far outstrip the underlying rate of inflation on other goods and services. A Diamond DA40, for example, sells for more than $400,000, up from $358,800 in 2008.

To be fair, some of these price increases account for incremental improvements, mostly related to avionics. And although it can be argued that these improve capability, they don't really improve the airplane's basic function or performance. Cruise speeds haven't changed and most still use leaded avgas. Buyers are noticing and failing to see value in new aircraft. A certain psychological price barrier may have been passed.

"So at the higher prices, buyers are saying, 'I could do that. I get it.'

In a twin market gutted by high fuel prices, the Cessna 421, left, remains a popular airframe. Excalibur's refurb would convert it to a state-of-the-art turboprop.

But they won't buy. It's not that they can't, they won't. They can't justify it," says Premier Aircraft's Jeff Owen. Fort Lauderdale-based Premier specializes in late-model used Diamond, Mooney and Piper aircraft. Owen has years in the industry selling Cessnas, Diamonds and everything else and lately, he and Premier have launched their own response to escalating new aircraft prices: a refurb program of its own for Diamond's popular DA42 twin.

WHAT'S OUT THERE

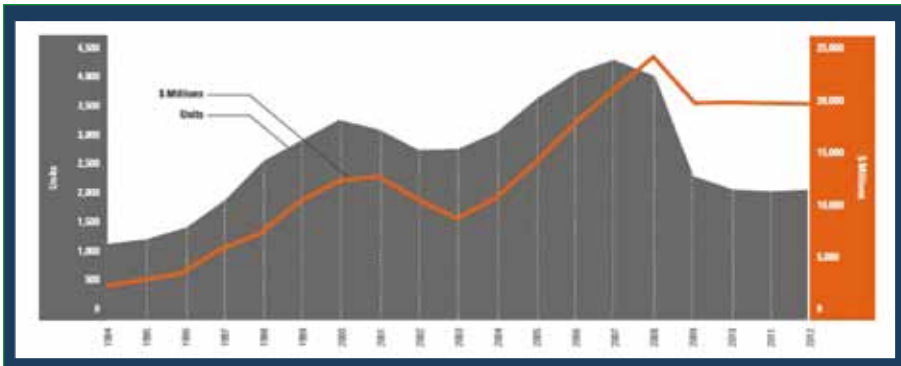
There's nothing typical about the emerging refurb/remanufacture industry, other than that sellers and buyers are finding exceptional value in upgraded airframes brought to near-new standards and selling for 50 to 60 percent of the price of new. The refurb industry sorts itself into two broad categories: Companies that offer remanufactured airframes with substantial upgrades such as engines or avionics and those that sell or customize old models with repairs, rework and sprucing up of the existing airframe.

In Premier's case, the company's refurb efforts grew out of frustration in trying to spark movement in the used DA42 market. Those aircraft were equipped with Thielert's Centurion 1.7, the launch diesel powerplant that tarnished the airplane's reputation when it ran into maintenance and warranty issues in 2007.

Premier primed the used DA42 market by buying up used airframes, gutting them and upgrading the engines to the Centurion 2.0. The airplanes get new interiors and paint, as necessary, and sell for half the price of a new DA42.

"The buyers are seeing good value in that they're buying a near-new airplane with 2.0 engines. That's compelling," Owen says. Premier has completed eight of the refurbs and Owen believes the market for used diesel twins will sustain.

Jack Pelton, Cessna's former CEO and now EAA Chairman, is involved with a twin remanufacture project of his own (through Aviation Alliance LLC) in the Excalibur 421, a ground-up re-do of the Cessna 421.



The above chart from the General Aviation Manufacturers Association tells the economic story of why the refurb market is booming and poised to get stronger. After 2008, world aircraft production plummeted and so did overall billings, as represented by the orange line. But as units shipped continued to decline, billings recovered so as of 2013, the industry was billing more and shipping less. That's another way of saying in a declining market, manufacturers simply raised their prices to maintain profitability, a counterintuitive strategy.

The Golden Eagle is a unique piston twin that remains in strong demand on the used market. Except when the Excalibur conversion is done, it's no longer a piston airplane but a turboprop, converted to Pratt & Whitney PT6A-135s from the stock—and finicky—Continental GTSIO-520s. Why not just buy a nice Conquest for a lot less money than the $2.5 million Excalibur will ask for its remanufactured 421? Maybe because the Conquest won't cruise at 300 knots, the Excal's claimed performance.

Moreover, the Excalibur will be pitched as an essentially new airplane, with Garmin avionics, a state-of-the-art interior and improved brakes and de-icing. "This is really a new airplane," Pelton told us, and given its range and speed, it fits into a market niche where the 421 cabin and payload finds little competition. Pelton concedes the price is the same as a new Mustang jet, but operational costs and pilot qualification and training will be substantially less.

And speaking of jets, Nextant

Nextant Aerospace has achieved spectacular success in refurbing the Beech 400 X/XP series. Nearly 40 have been converted and the order book is full.

Introduced just last July, Redbird's Redhawk refurb project, left, has already gained serious traction, with the third aircraft nearly complete and at least 30 planned for the coming year. A basic assumption of all refurbs is that they'll rest on a foundation of new avionics, lower left.

Aerospace has had what can reasonably be called spectacular success in remanufacturing the Beechcraft 400X/XP into what it markets as the Nextant XT. Thus far, it has completed 32 aircraft with $175 million in orders still on the books. Nextant has been so successful, in fact, that it has achieved an important marketing milestone in every refurber's ideal business plan: A line listing in *Aircraft Bluebook Price Digest*. That's valuable because it gives appraisers and banks a hook on which to hang loan values.

Nextant's Jay Hublein says the company wasn't launched with a single remanufacture project in mind and although he declined to name specifics, he told us the company is exploring more aircraft types to roll into its business model. At the NBAA show in Las Vegas in October, Nextant did pull the curtains back on one of its next projects: re-engining King Airs with GE turboprop engines developed from the old Wolter line, an Eastern European stalwart that GE folded into its turbine business.

Heublein says Nextant is convinced that new aircraft prices will remain too high for many buyers for the foreseeable future, meaning there's plenty of headroom for companies mining the value in older airframes that can be brought to new standards. With new bizjet prices climbing too, it doesn't take a marketing genius to see rework opportunities at nearly every level, from engines, to wing mods to avionics packages. Companies like Cessna and Bombardier may have cause to worry about such market trends, since they need every sale they can get.

THE LOW END

There's room for organized remanufacture at the lower end of the market, too. We've recently reported on Redbird's Redhawk project, which converts an older Cessna 172 to a Centurion 2.0 diesel and adds Aspen glass, new paint and upholstery for a package that they hope to sell at the $200,000 mark. The Redhawk is aimed specifically at a narrow niche: the training market.

When we visted Redbird's San Marcos, Texas, facility in late October, we were surprised to see the third conversion was already underway. The company expects to buy as many as 30 older 172s by the end of the year to scale up the project to a volume that may soon rival Cessna's output of new 172s, at $415,000 per copy. Redbird plans to put the first six Redhawks on its own flightline as test beds, then branch into sales and leasing with other schools.

As press time, Redbird was negotiating with Brown Aircraft Lease to place a batch of Redhawks into flight schools sometime next year. (For more on the Redhawk, see the October 2013 issue of *Aviation Consumer*.)

If the Redhawk idea soars, it's easy to see how it can be applied to other airframes. And at least one business is already doing that and has been for 10 years. Matt Kozub's Pristine Planes—doing business under the

Aircraft Sales, Inc. banner—refurbs airplanes of all kinds, from singles to light twins. Kozub told us Pristine Planes approaches the market in two ways: It restores popular models on a spec basis or will take on custom remanufacture under a program it calls Plan-a-Plane, which allows a customer to specify any level of upgrade or mod. While other refurb houses seem to specialize in specific models or types, Kozub does not.

"You box yourself in if you specialize too much. I've found over the years that certain models will get hot and cold," Kozub says. Right now, six-place airplanes—Bonanza 36 series and Saratogas—are in demand and despite high avgas prices, Kozub thinks twins are coming back. Although lots of smaller shops are producing one-off refurbs, Pristine Planes isn't one of them. The shop turned out 30 aircraft last year and expects more growth in the immediate future, especially if new aircraft prices remain high.

CAN THIS SUSTAIN?

While the size of the new aircraft market has diminished in both dollars and units, we couldn't find any reliable sources to confirm the size of the refurb/remanufacture market, although there's good evidence that it's growing, perhaps briskly. And companies in the industry know it. Both Garmin International and Aspen Avionics told us the legacy fleet—and that's what the refurb market is, after all—will continue to be a major business driver for them.

Indeed, Aspen's products are tailored for retrofit. Banks, too, are noting the trend and finding profitable business in loans for aircraft selling at four times their non-improved market value. Insurers and appraisers are starting to catch up too, reacting to market forces they have no control over.

Says Jack Pelton: "If we open the discussion without getting specific about types of airplanes, I do think it's a growing trend. It's currently the only counter to deal with the exorbitant price of the new products that are out there today."

This may represent a definite challenge for manufacturers trying to survive, much less prosper, in the new aircraft business. But will it dent OEM sales for the short term?

"I can't tell right now," says Pete Bunce, head of the General Aviation Manufacturers Association. "I don't think anybody has that good a crystal ball," he adds. Still, he sees a trend toward refurbing older airframes as a net positive. "There's value to be added to the chain no matter where you are in it."

Money will go to the OEMs for parts and services and that business comes at a lower acquisition cost. The OEMs will make money," Bunce says. He's been forthright in explaining that the escalating cost curves for new aircraft have to be curbed if the industry is to prosper. GAMA thinks the proposed revision of FAR Part 23 will do that, once the final rules are promulgated and put in place by 2015.

In theory, these will simplify certification programs and reduce time to market, thus reducing cert costs and, hopefully, new airplane prices. But if they also make it easier for refurb shops to install avionics and other gear, so much the better.

"I don't think there's any question that this will help," says Pelton. But the effects may be a few years off, leaving high-value niches in the market for companies—and some individual owners—to bring aging airframes up to near-new standards.

"Unless somebody has a new airplane that's providing performance, technology—say getting away from 100LL or something truly unique—the value proposition is pretty tough to beat in going to a refurbished product versus a new," says Pelton.

REFURB PROJECTS: BETTER KEEP IT

There was a time in the not-that-distant past when older airframes were actually appreciating, especially popular singles like the Mooney M20J and the Beechcraft 35 series. But not any more and not to return for the foreseeable future.

In fact, used aircraft prices remain soft, although sales activity is up. The highest asking prices go to airframes with some upgrades and/or low hours, of which there are ever fewer to pick from.

That may argue for buying a basket case yourself and taking on the full refurb job. But this makes sense only if two conditions are met: you buy the airframe right—or already own it—and you plan to keep it for a reasonable period. What's reasonable? At least five years or until you get your money's worth out of the upgrades. Because you're not going to get much money back, this is a harsh fact of airplane ownership that is both established and proven.

The market waxes and wanes with various states of refurbished aircraft, or at least airplanes that might have had some avionics upgrades. It's common to find an older airframe, say a mid-1980s Mooney M20J or a Cessna 210, with one or a pair of Garmin GNS430s that can form the foundation for more extensive upgrades. The rule has always been if you can find what you want or close to it already on the market, you're better off buying it than doing all the work yourself. Let the seller take the depreciation hit on the upgrades and pocket his misfortune.

Depreciation on professionally refurbed aircraft is somewhat of an unknown, but there's no reason to believe they don't depreciate just as new aircraft do, if not a little faster because the airframes are older. There simply aren't enough registered sales to gain a clear understanding of value. That can only emerge in the buyer/seller negotiation.

***Aircraft Bluebook Price Digest* has long given best-available estimates of what conversions and upgrades cost when new. *Bluebook's* general guideline for avionics is that they lose 40 percent of their value in the first year, 45 percent the second year and by five years, that new GTN 750 you have your eye on will be worth 30 percent of what you paid to have it installed. And therein lies the wisdom of keeping the airplane. In five years, you'll have gotten enough enjoyment out of the equipment to justify its cost and it won't depreciate much for the next several years, at least.**

Xavion: Ideal for Emergencies

Emergency landings are more common than mid-air collisions. We think $100 for an app that is designed to guide you to a runway is pretty reasonable.

by Rick Durden

CHECKLIST

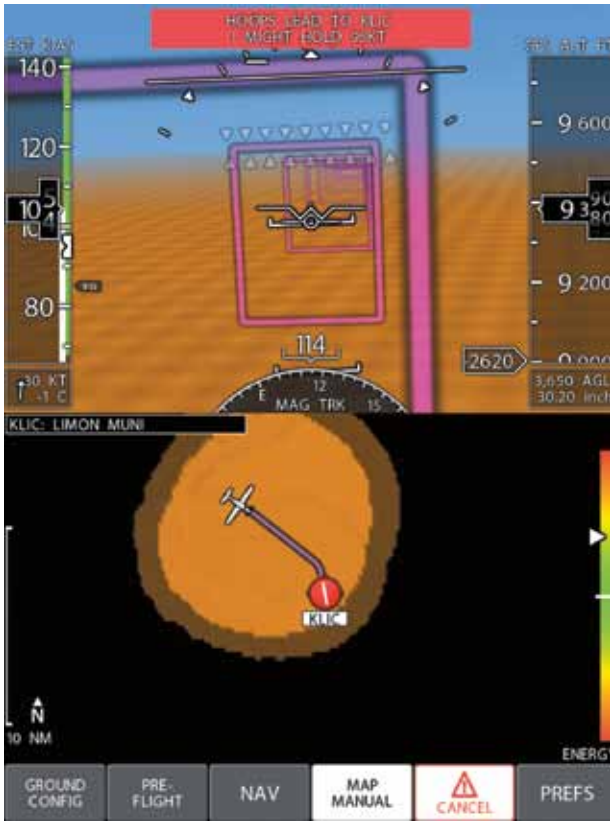
- ⊕ The emergency landing feature gets you to a runway effectively.
- ⊕ The PFD is adequate for instrument reference in an emergency.
- ~ Xavion provides a manual for the app, but it can be confusing.

The advertising for Xavion's emergency landing guidance, synthetic vision, navigation, instrument panel backup, ADS-B weather, weight-and-balance calculator, runway takeoff planner and personal currency record app has seemed shrill to us. The claims that it could save your life should the instruments fail or the engine quit as well as help you through a ramp check came across as over the top—so we tested it.

Bottom line—the ramp check claim is nonsense, but the rest of it is true. For $100 ($99.99), and a little practice with the app, the instrument display is good enough that you can probably rely on it to stay right side up while you get out of the clouds and the forced landing emergency feature—again, with a little practice—can significantly improve your chances of a good outcome.

We like the app. A lot of thought and work went into developing the emergency landing software.

We suspect most pilots will ignore some of the features; the highway-in-the-sky nav mode isn't great, but the weight-and-balance calculator is handy and the runway distance and heading warning arrangement may save a life or two.



Xavion in emergency landing mode: Boxes in upper display lead along the magenta line to the runway. Airspeed display is indicated, not groundspeed. The right vertical indicator on lower display is energy meter—the airplane is slightly high and fast.

APPEARANCE

Once loaded and launched, the screen presents, in portrait mode, a generic glass cockpit PFD and directs the user to the "orient" button to initially level the symbolic airplane in pitch and roll. Of course the "orient" button is not displayed. It's in a submenu, so searching is required—that didn't give us any warm fuzzies out of the box. Once the iPad is oriented vertically and the level button pressed, the PFD lines up and begins operating. As you tilt the iPad to a comfortable reading position, the unit hollers, "Attitude!" The terrain alert feature is set up to warn if the airplane is in a pitch attitude that will cause it to hit the ground within 60 seconds.

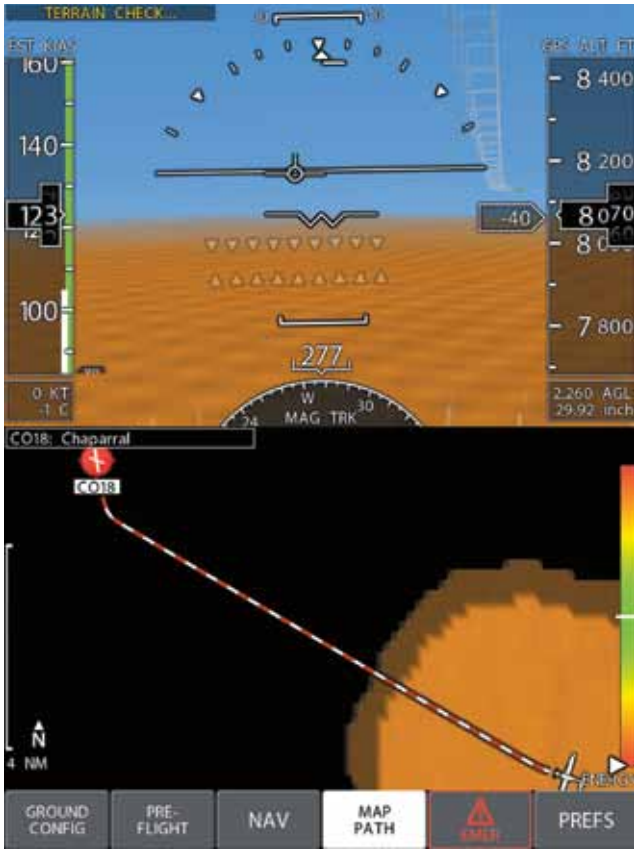
The lower half of the presentation is a constant display of how far you can glide, the appropriate route to fly to the nearest airport and whether you have the altitude to make it. If in gliding range, you see a magenta line that gives the route to fly to the end of a runway. If not, the line becomes a barber pole—danger. You can immediately look for a good place to park the airplane that is within gliding distance. It's intuitive and simple. We like simple, especially when things are going wrong.

SETUP

We were very glad a manual was available on the Xavion website. We just wish nearly as much thought had gone into it as into the app itself. It has a number of gaps (we never did figure out how it wanted us to calculate glide ratios) and reads as if roughly translated into English.

In the course of about 45 minutes with the POH, your logbook and a calculator, you input the weight-and-balance information for the airplane, its performance at different altitudes,

In cruise (nav highway-in-the sky boxes above and right), the app constantly displays route to best emergency runway in lower display. Red and white bars on route mean the runway is out of gliding range. Burnt orange circle depicts potential gliding range.



dates of the pilot's last flight review and IPC and power-off glide ratio, clean.

The system wants to know the power-off glide ratio at best glide speed, clean, with the prop at the high RPM—highest drag setting; the ratio, clean, with the prop at the low RPM setting and the ratio with the gear and flaps down, prop at high RPM and the speed at the max allowed for full flaps—essentially how it glides at best plummet speed.

The app calculates the emergency landing glide path based on the glide ratio between best and worst—essentially the way pilots doing competition spot landings do their glides. You aren't gliding as far as theoretically possible at best glide speed and the prop pulled back—you're going a safe distance with a margin of error. We think it's a smart system.

ADS-B weather loads automatically and is used for the ongoing computations for the nav, takeoff length and emergency glide features. Only a Sagetech Clarity or iLevil ADS-B receiver will share information with the Xavion app. Without ADS-B info, you input wind and barometer settings manually for each flight.

IN USE

Calculating weight-and-balance takes less than a minute, and it's easy to see if you need to move weight around to stay within balance as well as where to put it.

Xavion keeps track of each takeoff you make, including weather, paying attention to how much distance it takes to get to 50 feet. When you start a takeoff roll, it automatically considers the runway you are on and the weather and warns you if it doesn't think the runway is long enough for takeoff based on your history. We think this could prevent a wrong runway or too-short runway takeoff accident.

In flight, the nav function uses a highway-in-the-sky, fly-through-the-boxes arrangement. We did not find it easy to use and felt it required a great deal of head-down time.

It is interesting to watch the radius of action display on the bottom half of the screen as it constantly updates to show how far you can glide and the emergency route to the nearest airport.

If you have a power loss you can't fix and decide it's emergency landing time, press the emergency button near the lower right corner of the display.

The highway-in-the-sky boxes appear to guide you along the route to the nearest runway. It takes a little practice to fly through the boxes, so we recommend practicing after installing the app.

We found that if we got distracted doing something else, there were times we'd look back at the display and couldn't find the boxes. The route display helped us get pointed in the right direction and find the string of boxes again.

An "energy meter" on the lower right side of the display lets you know if you are trending high and fast or low and slow. It worked well on a day when we were dealing with 35-knot winds.

The boxes get smaller, vertically, as you approach the runway. In our review we found that the system consistently got us to a runway in a position to land, although on one, the tailwind was so strong we probably would have gone off the end had we landed. That's a minor point—going off the end of a runway at 20 knots is far preferable to touching down on a poor landing site at 60 knots.

In cruise, we much preferred to use an app that had a moving map with an up-to-date database and leave Xavion running in the background. How long would it take to switch to Xavion and get emergency landing guidance should we need it? Each time we tried, the switchover was complete in 30 seconds. It took a moment more to hit the emergency button. The boxes popped up immediately. We think that's plenty fast.

CONCLUSION

We came away thinking that if we lost the engine, at night, in the clouds and there were an airport within gliding distance, we could hit a runway using Xavion. If the vacuum pump blew or the glass cockpit went dark, we could probably fly the airplane using the Xavion PFD.

We pilots, being human, tend to worry about the wrong things. The most common cause of general aviation accidents is runway loss of control, but we resist taking dual in takeoffs and landings as if it were a disease. Mid-air collisions are near the bottom of the risk scale for accidents, however, we spend thousands on traffic avoidance systems. We are much more likely to have some sort of power loss and have to make an emergency landing than have a mid-air. A hundred bucks to greatly mitigate the higher risk event makes sense to us.

Used Twin Market: Is It Time to Buy?

Even assuming twins are three times the cost to operate as a comparable single, prices of the most capable are so low that a purchase makes sense.

by Rick Durden

The smart money says that buying a used piston twin is crazy when avgas costs seven bucks, an engine overhaul runs north of $30,000 and often a twin isn't that much faster than a comparable single. After looking at the stunning collapse of piston twin prices in this century, we're tempted to simply say the smart money is right and let things go. The problem is, it's just not that simple. If you want serious transportation and are realistic enough to know it ain't cheap, then current prices may mean the right decision for an airplane to go places is either a pressurized piston twin or 170–190-knot light twin.

As a side note, we recognize that airplane purchase decisions are not always steely-eyed, economic choices; they are heavily affected by emotional factors ("I know the chance of engine failure in a single is low, but I fly IFR at night, over the Great Lakes, where there's ice.") We never, ever forget that when selecting the family airplane, a happy spouse is often the deciding factor, so space and comfort matter and may tilt the economic equation toward the airplane with the better cabin.

TRAVELING MACHINES

Few pilots buy a piston twin for the purpose of going for a $500 hamburger or watching the sun go down—they want traveling machines. As such, the decision to buy a twin versus a capable single starts out with an objective look at the variables of speed, range, useful load with full tanks, cost of operation, avionics and ability to deal with weather. It then moves into subjective areas—cabin comfort, pressurization, perception of safety, required skill level and dispatch reliability.

That moves the evaluation into what really matters for an airplane doing what airplanes were built to do—go somewhere fast. The entry-level cruising speed for piston twins is on the order of 150 knots—except for the Piper Apache, but it's a special consideration, (see the sidebar).

Because speed matters, an early part of any single-versus-twin evaluation involves direct speed comparisons. Therefore, the singles to be matched with twins are the Cessna 210, the retractable 182s and Corvalis, Piper retractable Saratoga series and the Malibu/Mirage/Matrix, Beech 36 series, big-engine Mooneys and the Cirrus SR22. As a reference, a decent, normally aspirated 1980 Cessna 210N has a *Bluebook* value of $90,000. Other than for the retractable 182s, the prices go up from there, with the top-of-the-line, glass-cockpit singles in the million-dollar range, especially if you want pressurization.

OPERATIONAL COSTS

To be realistic in the single versus twin purchase decision, we are convinced that the overall cost of operation of a piston twin should be considered to be three times that

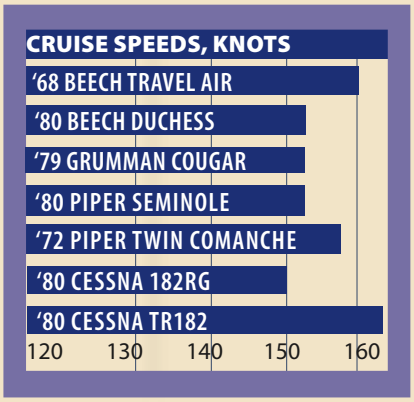
Clean lines, thin wings and big engines give Aerostars blistering speed. This is a serious traveling machine with major-league fuel flow, complex systems and demanding handling—a pilot who respects the airplane can get tremendous capability and utility from it.

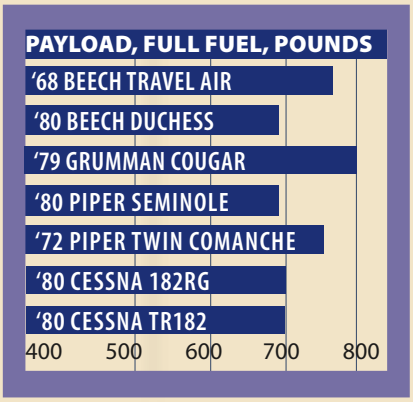
CHECKLIST

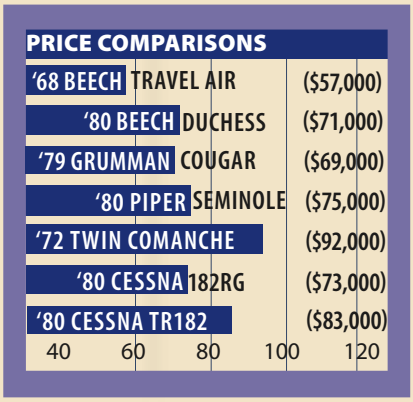
- Prices and capabilities of singles mitigate against buying a light-light twin.
- Light twin prices are low enough that purchase may make sense.
- Pressurized twin prices are so low that now may be a good time to buy.

THE NUMBERS: SELECTED PISTON TWINS AND SINGLES COMPARED

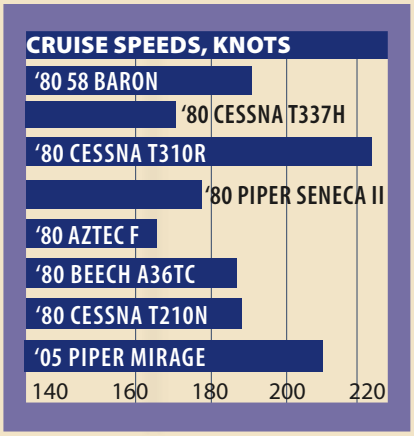
Light-Light Twins and Comparable Singles

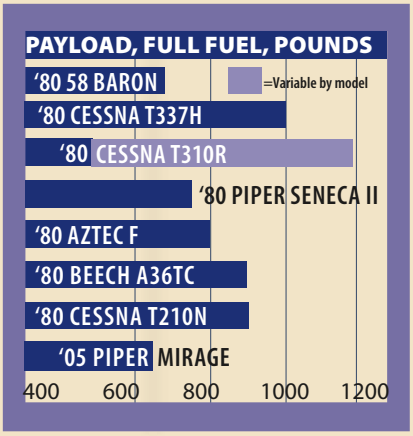


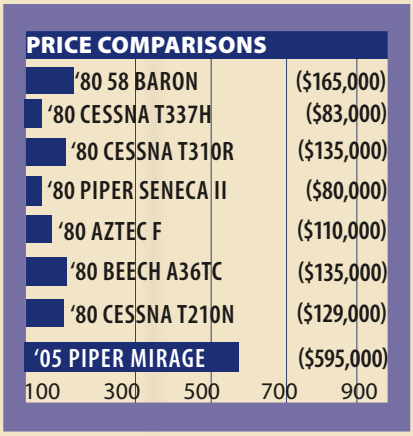




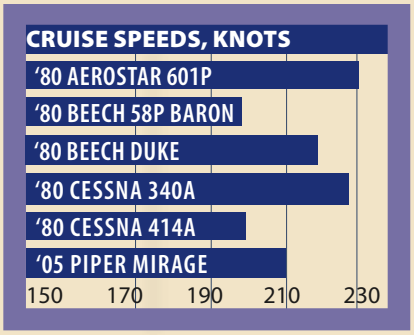
Light Twins and Comparable Singles

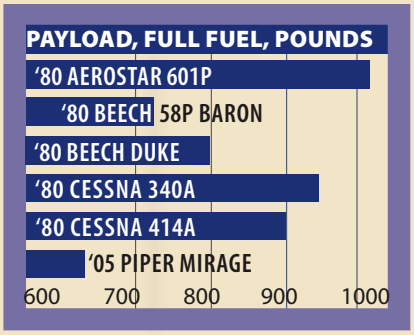


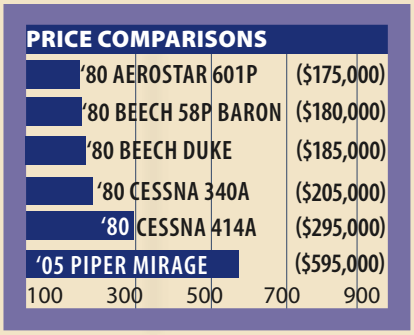




Pressurized Twins and the Piper Mirage







of a comparable single, rather than twice. That may seem overly conservative, but we've been there. The added complexity of systems to care and feed two engines (think four, six or eight fuel tanks with crossfeed plumbing), training required by insurance and the proclivity of FBOs to charge more for twins, even for parking—despite their having the same tiedown footprint as a single—our experience as twin owners and feedback from users is that three times the cost of a single usually comes pretty close to the mark, depressing as it may seem. If nothing else, let's just say that if you plan for three times the cost of a comparable single, you aren't likely to be financially surprised.

With that as background, let's look at a selection of the most popular piston twins by category to see if there are any that might be a deal.

LIGHT-LIGHT TWINS

The Piper Apache, Twin Comanche and Seminole, Beech Travel Air and Duchess, and Grumman Cougar fill this category. The Travel Air is the fastest at 160 knots, with the Twin Comanche, with 160-HP engines, a close second. Figure on 150-155

APACHE: MULTI-ENGINE TIME BUILDER

An Apache lumbers along at maybe 130 knots, mostly because it has a cabin the size of a ballroom. It also has a hydraulic system and four bladder fuel tanks—and plumbing—that can make maintenance an odyssey. Nevertheless, the price for a one in decent condition, without frills, has held remarkably steady during this century. $34,000—give or take a bit—will buy one. That's the same value put on them by the *Bluebook* in 2010 and only $4000 less than in 2005.

The stupidly, in our opinion, onerous new requirements for an ATP rating mean that applicants—after spending on the order of $10,000 to meet the new 30-hour classroom and 6-hour level C or D simulator time requirement—will also have to have 50 hours of multi-engine time. With the days of the night check hauler time-builder jobs gone, it means that most of our airline pilots-to-be will gain "experience" grinding around the pattern as instructors and may have to buy their multi-engine time.

For three decades, pilots who wanted to gain multi-time quickly and as inexpensively as possible have joined together and bought an Apache. They've set power at about 50% and pointed it across the country, building time at 120 knots and 14 GPH. They've also discovered that the Apache is a better multi-engine trainer than the more modern Seminole or Duchess because it has a real Vmc to be respected, and merely holding altitude with one engine out requires truly being able to fly on-speed and with zero side-slip.

Trying to keep costs down while they were building time, many found mechanics who would let them work on their airplanes under supervision—and an Apache can require a lot of work per hour of flying time. Using sweat equity, they were able to afford to fly and they learned about airplane systems—because the Apache has an electrical and hydraulic system every bit as real as much larger airplanes.

Then, once most of them got the time they needed, they sold their airplanes for about what they paid for them. Well, most of them did—a few became irrationally attached to the world's largest flying sweet potato and kept them even as they were hired by the airlines and moved up the seniority ladder.

We suspect that the new ATP rules are going to renew interest in finding ways to build multi-engine time as inexpensively as possible. We think the Apache may just fill the bill. We'll be watching to see what hapens to the prices.

knots for the Cougar, Duchess and Seminole, although the Cougar does it on 160 HP a side as compared to the 180-HP power of the Duchess and Seminole. Plan on 130 knots for an Apache.

Travel Airs were built from 1958 through 1968 and show values from $35,00-$67,000. Duchess production ran from 1978 through 1982 and values now vary from $62,000 to $86,000. Piper Seminole production began in 1979, there was a hiatus between 1983 and 1989 when it was restarted—it continues to this day. A 1979 model is valued at $70,00—all pre-hiatus models are valued under $100,000. Two turbo models were built during that time and are valued at under $100,000.

The Piper Twin Comanche had a production life from 1963 through 1972 and a number of iterations, including a six-place version and turbocharging. Values range from a low of $62,000 through a high of $102,000. The Cougar was only built in 1978 and 1979, and values run between $67,000 and $69,000.

For cabin size and performance, the light-light twins may be compared with the Piper Turbo Arrow, Cessna 182RG and TR182, Cirrus SR22 and big-engine Mooneys. The Mooneys and Cirrus are notably faster and more expensive, however, the retractable 182 series has a low value of $68,000 for a 1978 182RG and goes up to a high of $128,000 for the last of the TR182s. Turbo Arrows start at $64,000 for a 1977 model and go up to $112,000 for the last of the line built in 1990.

You can fill the seats and the tanks in most of the 182RGs and TR182s, something not possible in the light-light twins. While an early Travel Air is half the price of a competitive single, corrosion on some of the magnesium parts in the airframe and having to overhaul one engine can erase that advantage in a hurry.

The Twin Comanche and the Cougar are rightly touted as fuel-sipping twins, but with the more-comfortable cabin, the retractable 182 series, at the same or slightly higher purchase price and lower fuel burn, makes more economic sense.

Additionally, the fact that another comparable single, the Cirrus, has an airframe parachute, makes the redundant engine of a light-light twin seem a little less worth the money it costs for perceived safety at night or in IFR.

Over mountains, no light-light twins have a single-engine service ceiling that will allow staying above the rocks, although "drift down" from higher altitude does give a wide radius of action before the service ceiling is reached.

In our opinion, from a strictly economic point of view, the comparative price and capabilities of singles mean a light-light twin doesn't make sense in this market.

LIGHT TWINS

Taking the next step up, we get to the Beech Baron series, Piper Seneca and Aztec, Cessna 310 and 337. All have

Light-light twins such as the Piper Twin Comanche (top) and Piper Seminole (middle) generally don't make economic sense when compared with the abilities of a big single—unless you need two engines. Cessna 414 (bottom) has a big comfortable cabin, decent speed and will do more than a single that costs twice as much.

engines of at least 200 HP and cruise speeds of at least 160 knots (well, sort of; the 337 falls a little short), with the short-bodied Baron doing an honest 190 knots and turbocharging pushing speeds well over 200 knots at altitude.

This is the entry level, in our opinion, for serious traveling machines. The airplanes are often equipped for known icing. In most cases, insurance coverage requires pilots to take recurrent training annually, a two- or three-day exercise.

System complexity becomes an operational and maintenance issue. An Aztec has four bladder tanks that aren't cheap to replace and a hydraulic system that needs to be maintained aggressively—plus, just checking the fluid level requires putting the airplane on jacks and retracting the gear. A 310 can have as many as six fuel tanks, with limitations on which can be used, when—turbocharged versions have exhaust systems that require maintenance by someone who knows them.

Corrosion is a serious issue on all older airplanes, with the overwing exhaust versions of the 310 having a bad reputation. We have seen mid-1960s 310s on the market for as low as $14,000 recently, but a casual look indicated that making one airworthy would cost more than the roughly $50,000 *Bluebook* value.

Bluebook values for some of the earliest models of the light twins are so low that you might be able to buy one with your credit card—$28,000 for a 1955 310 and $29,000 for a 1960 Aztec.

Realistically, for a 1980 model airplane with decent avionics and mid-time engines, look at a range of $79,000 for a normally aspirated Cessna 337; $80,000 for a Seneca II; $110,000 for an Aztec F; $125,000 for a 310 and $165,000 for a 58 Baron.

The challenge is to find a comparable single that will carry the load and is nearly as fast—which limits the club to the turbocharged retractable Saratogas, Cessna 210 series and Beech 36. A 1980 version of each is valued at $125,000, $90,000 and $130,000, respectively. The more recent Malibu Matrix, which is comparable to the Baron and 310 in speed, starts on the used market at $540,000. Piper Malibu/Mirage prices start as low as $135,000, but rapidly blow through $300,000 and into the $500,000 range.

We think the light twin class of piston twins mark the crossover point to where purchase prices are low enough to make economic sense. Even with the cost of twice as much fuel, three times the maintenance and refurbishing the avionics and interior on top of a $130,000 purchase price, a light twin can fly a long way for many years before the owner catches up with the price and operating cost of a $300,000 single that can't carry as much, has a smaller cabin and may or may not go as fast.

CABIN CLASS TWINS

At the top of the multi-engine piston heap, both pressurized and unpressurized, are the ones that have an airstair door: the Beech Duke, Piper Navajo series, Cessna 335, 340 and 400-series and Aerostars. We'll stick the Pressurized Baron in here, even though it has an overwing entry. We'll also mention the last versions of the Twin Bonanza, with airstairs and a stunning ability to haul a load.

Many of the unpressurized cabin twins continue to be popular in the Part 135 world, where they can earn their owners a decent return flying charter customers or freight. However, we've observed that owner-pilots tend to migrate to the pressurized birds, apparently figuring that if they are going to pay the price of buying, feeding and maintaining a cabin-class twin, the extra price for pressurization isn't that much for the benefit it provides—so we'll concentrate on them.

Pressurized Barons range in value from $140,000 for a 1976 product, through $235,000 for the last year of production, 1986. The Duke has a wider range, from $80,000 for a 1968 version, through $220,000 for a 1982 model. We're not particularly big fans of the Duke—its TIO-541-

continued on page 32

Back To School: Garmin Avionics Training

We took Garmin's factory pilot training course for the GTN 750/650 and G500 retrofit products and found it to be fast-paced and information-rich.

by Larry Anglisano

In the Garmin GTN navigator owner survey (March 2013 *Aviation Consumer*), some respondents dinged the product for having a steep learning curve. Moreover, we heard from owners who took Garmin's factory training course, commenting that it was too short—and fell short—when it came to mastering some of the subtleties of the system's feature set.

Garmin recently extended the length of the $525 course (that's only offered at the company's Olathe, Kansas, support and training center) to accommodate a full two-day curriculum. They've also added the G500 primary flight display interface to the training.

To see exactly what the course covered and to gain a sense of whether it's worth the effort and cost, we traveled to the Garmin factory and completed the training program. We found it both comprehensive and fast moving.

DIVERSE STUDENT BODY

Don't be fooled into thinking this course is attended by amateurs. It's quite the opposite, actually. Our course included nearly a dozen students with diverse backgrounds, including some professional pilots. There were retired airline captains, corporate pilots and aircraft owners with years of flying experience. Some built their own aircraft and installed their own avionics.

"I'm here after flying my twin Cessna into inadvertent IMC, late at night, with a freshly installed Garmin package. After a near-auger, I knew that I needed to get structured training," said Mark Hangen, a pro with years of experience flying a variety of corporate-caliber aircraft.

"As an old grayhair, this stuff is tough to learn on your own," said another pilot with a complete Garmin suite in his P210. He also brought his copilot to the training.

The class was led by Garmin's Christopher Benson, an easy-going and patient product trainer with airline flying experience. Benson was armed with two full days' worth of material to present, and there was little down time. Students follow along with Benson, who presents the material on two large monitors at the front of the classroom.

The training center is collocated with Garmin's technical support center that staffs a diverse group of product support engineers (all are pilots). This allows most installation and interface-related technical questions that come up in the class to be answered by folks who understand the product line inside and out. The class also includes a tour of Garmin's manufacturing floor, plus a generous serving of food (including dinner) to fuel the brain. As a bonus, Garmin raffled off the latest Nuvi portable GPS, complete with a lifetime data subscription.

On each student's desk is an actual GTN750, GTN650 and G500 system. These systems run special demo software that enables the user to enter

The class size is small enough to accommodate personalized attention. Each student gets to operate actual hardware that's running in demo mode, left.

CHECKLIST

- ⊕ Each student gets an actual GTN750/650 and G500 to learn on.
- ⊕ Real-world scenarios and exercises help build confidence.
- ~ A focus on failures and autopilot interfaces was lacking due to time.

position, speed and altitude data for desk-flying procedures. As dry as avionics training can be, the live equipment adds a certain level of gee-whiz factor to the experience. It also allows students to venture into the operating logic at their own pace.

TWO-DAY CRAM

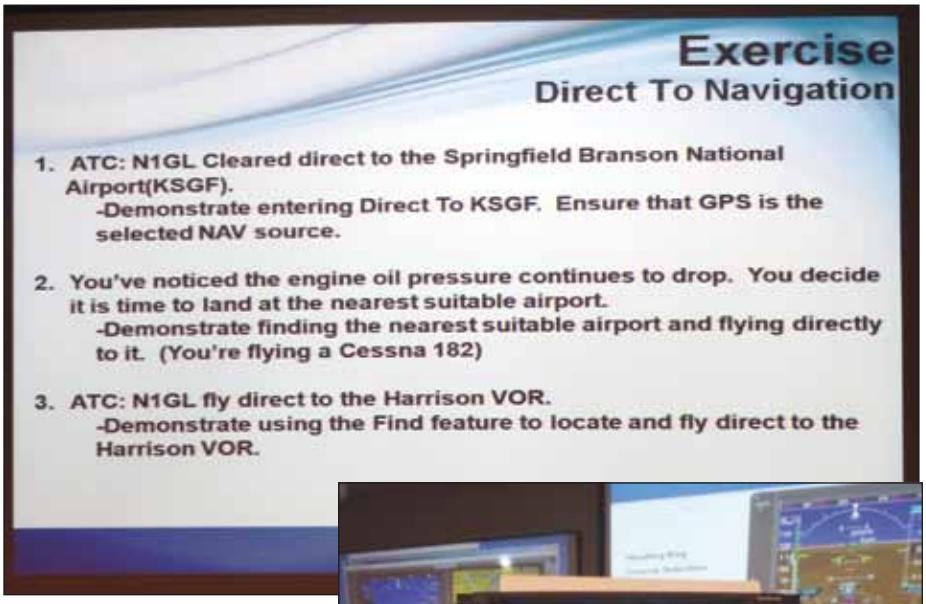
This is the second year Garmin has offered the training. While it originally started as a GTN750/GTN650 navigator stand-alone course, Garmin found that many GTN users also have the G500/G600 PFD/MFD system installed in their aircraft. As a result, they added another day to the course to concentrate on both systems.

The first day of the class focuses on the G500/G600 primary flight display and multifunction display operation. While the training touches on abnormal procedures, such as ADAHRS and potential LRU failures, it's not enough to prepare some users for dealing with real-world component failures, in our view. The curriculum does, however, cover the critical components in the system, so students can learn basic theory of operation while using the course as a stepping stone for pursuing more in-depth knowledge of potential failures.

Since many of the users who are new to the G500 are also new to flying with a glass PFD, Benson spent some time discussing the transition from round gauges to a speed and altitude tape presentation. You can't, of course, learn this transition in a classroom, but Benson offered useful tips for those learning the technology.

The G500/G600 training included the use of synthetic vision, or what Garmin calls SVT, for synthetic vision technology. There really is a right and a wrong way to use synthetic vision, and the course covers it.

Each student receives a training manual that contains more in-depth information on system components. The manual is also, for the most part, an outline of the entire course. We found it to be concise and helpful for following along during the fast-paced presentations.



What's there to learn about programming Direct-To navigation? There's plenty, actually. Scenario-based exercises helps users to operate the system to its full potential.

Another aspect of the interface that the course doesn't address in detail is autopilot connectivity. This, however, is difficult to cover because retrofits differ drastically from one to the next. Seemingly, there's a different method of user interface for every brand and model of autopilot.

For instance, a lengthy discussion developed over how to program the equipment to couple with a GPSS steering system. Even users with the same model of autopilot had slightly different switchology installed in the aircraft. That's where having access to product support engineers came in handy. Still, it proved that programming the autopilot is a big source of confusion.

During the latter part of the first day, the course covers the basic functions of the GTN units. This includes radio tuning, basic menu structure and other rudimentary functions that may seem trivial, but provoked more questions than we expected.

Since not all students have the flagship GTN750, Benson made it a point to also demonstrate the slight operational differences of the GTN650, when appropriate.

FLIGHT PLANNING

The second day of the course is focused completely on the GTN navigators and in particular, learning how to flight plan. Although some of the students didn't have a G500 installed in their aircraft, it was helpful to have the system connected to the GTN to utilize the electronic HSI.

One of the common stumbling

ROLL YOUR OWN GTN TRAINING

If you can't travel to Olathe, Kansas, to take the factory training course, there are alternate methods to get an acceptable education in GTN operation (face it, visiting the Garmin factory could require up to a four-day commitment when considering travel, depending on your location).

We asked Garmin's Chris Benson what he recommends for alternate and supplemental training material.

"I would definitely recommend that owners follow along with the GTN-series pilot's guide in conjunction with the GTN PC Trainer," he said. Both are available on the Garmin website and are supplied with every new GTN unit.

The GTN PC Trainer Lite simulates the behavior of the GTN interface, enabling the user to simulate a touch-and-drag interface to graphically edit flight plans by using the mouse cursor. It also has SafeTaxi, FliteCharts and simulates traffic and weather data. The rub here is that the PC Trainer Lite software is not compatible with Apple iOS.

For iOS, there is the GTN iPad training app. We found it to be more realistic than the PC Trainer because the iPad touchscreen capability makes the learning environment more realistic.

There's also a series of tutorial videos available on the Garmin website. You can find a link to them on the GTN product pages.

In our view, there's nothing quite like pushing the buttons on an actual unit and for that, Lone Star Aviation makes a GTN-series docking station. The $350 docking station enables you to remove the GTN from the aircraft, slide it into the docking station and power it up (it has a built-in power supply). On the other hand, we're not so sure removing and reinstalling a GTN is for everyone, so we recommend getting some help from a shop when appropriate. Contact www.lonestaraviation.com, 682-518-8882.

blocks for those new to the GTN is learning how to properly program the navigation source CDI output (VLOC and GPS). Benson thoroughly covered this critical function and also demonstrated the usefulness of the system's OBS mode.

Using real-world scenarios, including dealing with an ATC diversion from a loaded flight plan, students learn how to use the GTN map display and graphical flight planning to quickly get the aircraft going where ATC wants it to go, while reducing heads-down time fumbling with the box. Users that are new to the GTN might think of the map display as pictorial of where the aircraft is, but the course teaches that it's far more than that. Instead, it's a critical part of the interactive user interface, including flight planning.

The second half of the last day is spent covering departure, arrival and approach procedures. This is the part of the course where you'll want to pay close attention.

Again, Benson used real-world scenarios. For example, one exercise included building an entire flight plan, including the loading of a departure procedure, loading transitions, intercepting an airway, loading an arrival procedure and then loading and activating an approach. The exercise also included changing the flight plan on the fly—a task that users simply need to know cold. This includes programming and flying the missed approach.

CERTIFICATE TO LEARN

In our estimation, that's exactly what the completion certificate that hangs on the wall means. That's because the course alone can't come close to making a pilot proficient in operating a GTN and G500 in the real world. Further, there's so much to know about these systems that you'll need to operate them on a regular basis to retain the information presented in the course.

Still, we think the course succeeds for what it's intended to do and that's to make students feel more confident operating the equipment in the cockpit. We think the classroom environment is a good place to learn more advanced functions without the distraction of having to fly the aircraft.

Saying that, what might make the course better? We spotted a Frasca simulator in the back of the training room. If it were fitted with the equipment that was used on the desks, it might step the training up to another level. Then again, that would require more time—something that's already tight—even in a two-day session.

Benson said that it's possible that Garmin may eventually take the course on the road so students won't have to travel to the factory. On the other hand, we think the factory visit enhanced the experience. If you've never visited Garmin's Olathe operation, we think it's worth the trip.

"We really want the customer to feel confident when operating this equipment. Our goal is to help customers feel comfortable enough to perform advanced functions, including programming ATC reroutes, dealing with diversions and loading airways and procedures," said Benson. For these purposes, we think the course is worth the time and the money, if you can handle a fast-paced learning environment. Contact www.garmin.com, 800-800-1020.

Garmin D2 Pilot Watch: Novelty or Useful Tool?

That depends on your expectations. It has no shortage of sensors—or cool factor—but it's missing a GPS output.

by Frank Bowlin and Larry Anglisano

Pilots are known for large watches and an affinity for gadgets—high cool factors being important. If size and cool factor were the sole measures, Garmin's new $450 D2 Pilot Watch is the winner.

The D2 packs a chronograph, pressure altimeter, thermometer, compass and an aviation GPS. What else could the well-equipped pilot ever need on the wrist? Limitations of the size of the D2 mean you're not likely to intend it as a primary navigator, but it's easy to see the D2 in an ancillary or emergency role.

SIZE MATTERS

The D2 is large and roughly the size of a Casio G-Shock sports watch. A consequence of the size is that you're more likely to knock it around. We were careful, but still inadvertently smacked it on doorways, getting into the car and whacking other obstacles with it. In just a few days of wearing the D2, we scratched its mineral glass crystal, suggesting the watch's bulk makes it vulnerable.

The D2 has a soft and comfortable leather strap that gives the watch a high-end feel (as you would expect from a watch with a near-$500 price tag). Folks that find any watch uncomfortable might snub the D2 as soon as they put it on.

When the demo was forked over to a thin-wristed lady pilot, she immediately commented on its huge size. Used to wearing a big Breitling or Tag Heuer? The Garmin D2 will likely be at home on your wrist, even as a daily watch.

Garmin cites battery life as "up to" five weeks when used just as a watch and with the GPS off, or 50 hours while navigating. Most of us accept that "up to" describing battery life means "far less than." With the GPS turned off, and only pushing buttons occasionally, we comfortably got a few days.

With the WAAS GPS always on, we still got all-day battery life with quite a bit of user fiddling. The whole concept of charging a wrist watch seems foreign, but we charge our phones, tablets, and other gadgets every night, so why not add a wrist watch? Accept this, and we saw no common use-case where the battery would die before we were able to charge it. Charging is done through a standard USB cord attaching to the watch via a snap-on plastic backstrap (yes, yet another charging cable for the drawer). Charging from dead to 100 percent took less than four hours.

The D2 has an efficient and straightforward feature set, but we struggled with its small on-screen characters. Programming requires both hands off the controls to angle the display for optimum viewing, left photo.

CHRONOGRAPH

Garmin designed this thing to be a daily wrist watch. The main display is clean and uncluttered, with local and UTC time, day and date, a nifty outer ring that ticks seconds on and off sequentially like a game-show clock, and a satellite icon if the GPS receiver is on. While digital time displays are common, human factors studies suggest that an analog presentation of time is easier to grasp

CHECKLIST

- The D2 is versatile—serving as a sports watch for cycling and running.
- Hardware has a high-quality feel, but the screen data is difficult to read at a glance.
- GPS position feed for Garmin's Pilot app is missing.

The D2 is large but nicely scaled. Compared to the large Glycine Airman SST, the D2 is still bigger in diameter and thickness. But, the D2 isn't as heavy as it looks, so it doesn't feel bulky.

at a glance, so it's too bad this isn't a user option.

The watch can be set manually, but why bother? The D2's GPS knows the time closer than you could manually set it. Leave it alone and it always displays the proper local time, daylight savings adjusted. Rounding out the chronograph are a stopwatch, timer and alarm. The timer can be set to automatically begin another countdown cycle as soon as it hits zero. We've long thought this would be a useful feature.

The D2 has five buttons. Top-left is for the backlight and turning the device completely off—yes, completely off. Bottom-left is a dedicated "Return" button for menu navigation. The large orange button on the left side is the "action" button, and the two on the right side are up/down scroll buttons or Direct-To and Nearest when held. From the main time display, push the action button to get the top menu. Navigate the menu with the scroll buttons and press the action button for the page you want, such as stopwatch.

That stopwatch page has the time counter and the available functions of Start and Reset initially. Scroll to Start, press the action button to start the counter. The options now change to Stop and Lap. Scroll to Lap and press the action button to record a lap time. Scroll to Stop and press the action button to stop timing, then scroll to Reset and press the action button to reset it to zero. This is not difficult, just different than what we're used to in a watch. Once you realize how things work, it's simple.

We found that programming the watch isn't easily accomplished when gripping a ram's horn control yoke. That's because you'll need to angle the display to see it. While gripping the control stick of a Cirrus, it was impossible to see the display without letting go and twisting the wrist. Best case is to program while the autopilot flies.

PILOT STUFF

The D2 has a pressure altimeter. Adjust it with the local altimeter setting. Or, you can synch the altimeter to the WAAS GPS altitude if you don't know the local setting—a nice feature, in our view.

There's an internal temperature sensor. From pressure altitude and temperature the D2 calculates and displays density altitude. If you're wearing the watch, the built-in temperature sensor won't be accurate, of course. If accuracy is important, you can remove the D2 or use an outboard, wireless sensor, available separately.

Speaking of wireless sensors, the D2 is designed to control Garmin's VIRB action cameras. This can help solve the dilemma of controlling the cockpit cam when you can't get to it, enabling wireless recording start and stop action, or controlling the VIRB still shooting.

With GPS a magnetic compass seems redundant, but the D2 has one. However, the compass is active when the GPS is off, so you can get a quick orientation without the GPS draining the battery.

Of course, the feature that most differentiates the D2 is the WAAS GPS. Once you enter a flight plan, it'll navigate from point to point as you'd expect, with a diminutive HSI and even a map. It works.

The D2 has a geopolitical base map with cities and political boundaries. Of course, you can also enter user waypoints. But, the only aviation database is the identifier for public-use airports—no navaids or intersections. Search Nearest, for instance, to get a list of airport identifiers. If you know the identifier, select it and go. But, if you only know the desired airport by its name or city, you'll be guessing.

Garmin has actually done an excellent job maximizing the use of the 70-by-70 pixel display, except that they chose a stylized font that can make the miniscule difference between some characters (H/K, O/D,

A/R, etc.) difficult to distinguish. Add a little turbulence in flight and there will be user errors. The five-button user interface works well, although it's a bit tedious.

Other than perhaps with a different font choice, you're simply not going to get much more usability from a display small enough to wear on your wrist. It's not color, but with the limited data, color probably wouldn't improve legibility, while it would increase cost and decrease battery life. Want a GPS in a wrist watch? You're just going to have a small display and few buttons. It's a trade-off.

But, the limited database is the big obstacle to a meaningful flight plan. This can be overcome using the tablet-based Garmin Pilot program, with the bonus of the better user interface. Plan your flight in Pilot and download it to the D2 via Bluetooth, complete with all the waypoints. The D2 will then faithfully navigate waypoint to waypoint. Should you want to use Pilot in flight, however, the D2 cannot provide GPS data back to the tablet; you still need a remote GPS such as their GLO. That seems silly, requiring another gadget to set up. The Pilot app is mandatory for a full-capability front end to the D2, but the D2 won't provide GPS data back to the tablet. Seriously?

CONSUMER ORIGINS

The origins of the D2 as a consumer device remain and makes the D2 a worthy player for fitness sports. That's because it has a dedicated Fitness mode that's easily accessible from the setup mode. The software is designed so you can establish profiles for multiple purposes, such as one for pilot, runner and bicyclist. Garmin has remote sensors, including a Bluetooth heart-rate monitor and a bicycle cadence sensor. Combine these profile-based modes with the GPS and you get some real capabilities to monitor and even guide your exercise regimen.

You can even make use of the D2 for skydiving—adding the Jumpmaster application. This allows you to set the watch for guidance for three jump types (HAHO, HALP and Static).

The D2 is highly customizable. Want certain information on a display? Chances are you can either rearrange an existing page or create a new one tailored to your needs. The depth of capabilities of the D2 is really remarkable, and we only scratched the surface. Nonetheless, the D2 has far more potential for pilots than it realizes in this version.

For useful flight planning, you'll need to use the D2 with Garmin's Pilot app, top. We were pleased when the D2 easily paired with the sensors of a Garmin Edge cycling computer—including heart rate monitor and cadence sensor, bottom.

The other side of that is for buyers who buy the D2 thinking it will be an integral component in the cockpit can still make use of the thing if they end up never using it in the cockpit. During our trials, we used it during cycling and running workouts, where it performed flawlessly. But it is a pilot watch and for that purpose, it's not perfect.

We spoke with one of the D2 engineers and he suggested that our biggest overall gripes of limited database, difficult font and no GPS-out were not inherent in the hardware and could conceivably be implemented. If Garmin were to make those changes, the D2 will transform from "potential" to "usable" with a user software upgrade.

Even so, with the D2's existing capabilities, combined with Garmin's excellent engineering and solid build quality and, of course, the admittedly high cool factor, it will be a compelling gadget for some pilots. Contact www.garmin.com, 800-800-1020.

Frank Bowlin is the editor of sister publication IFR *magazine.*

Cirrus SR20

Roomy, comfortable, parachute-equpped and possessing decent speed, the SR20 does almost everything well.

It wasn't the first "plastic" airplane, but the composite Cirrus was far enough along the cutting edge to stir up the pilot community. Of course, some loudly asserted that no "real" pilot would want one of those things—it's got a parachute, for crying out loud. Yet the SR20 and its offspring the SR22 quietly and effectively changed ideas of what a personal airplane should look like, how it should be used and how it should be equipped.

The changes were evolutionary, not revolutionary—the first SR20s retained the familiar vacuum-powered round gauge flight instruments, albeit complemented by a large multifunction display. Today's copies have eliminated the vacuum system and gone all electric, with full glass panels; round gauges are only there for backup.

Though living these days in the shadow of its big brother, the SR20 has a lot going for it: It is comfortable, relatively economical to acquire and operate, has simple systems, comes with a well-defined support network and is faster than much of its direct competition. Later models feature the most modern technology available in personal aircraft.

Refinements continue to be applied, not just to the instrument panels but also to major airframe components. Oh, and it has an airframe parachute, too.

Fourteen years in the making, the market for used SR20s is mature enough to make it a very real option for buyers considering more traditional designs offering less.

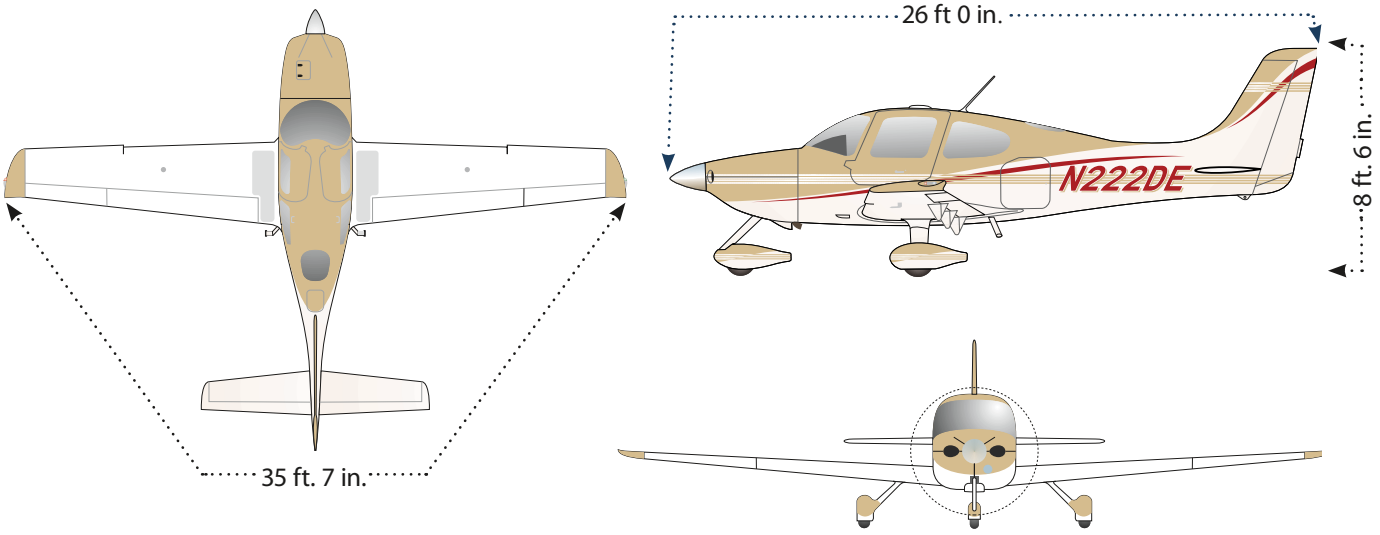
Though living these days in the shadow of its big brother, the SR20 has much to offer an owner.

HISTORY

Cirrus Design began life offering a kit for the VK30, a composite piston-single pusher seating five. By 1993, company founders—and brothers—Alan and Dale Klapmeier announced kits were a dead end for them. Even so, they maintained traditional airplanes from Cessna, Piper and others were too hard to fly, lacked intelligent safety features and failed to push the technological edge in both design and manufacturing. "We have to lose a lot of this macho stuff," Alan Klapmeier told us in a 1997 interview. "Making it too hard to fly is not a good value."

What eventually became the Cirrus SR20 emerged from that philosophy and, from the beginning, was a different airplane. In addition to composite construction, its side-stick controller (really a half yoke; its movement is the same as using one hand on a conventional control yoke, not a side stick), swing-up doors and then brand-new multi-function display immediately set it apart from the traditional airplanes coming from Wichita and Vero Beach.

CIRRUS SR20

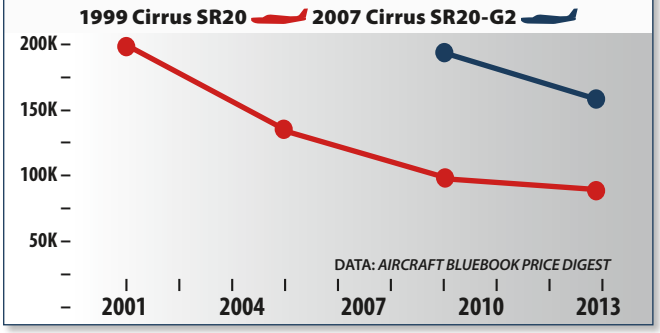


drawings courtesy
www.schemedesigners.com

CIRRUS SR20 SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1999 SR20	200-HP CONTINENTAL IO-360 ES	2000	$30,000	56	900 LBS	150 KTS	±$78,000
2003 SR20 (ALL ELECTRIC)	200-HP CONTINENTAL IO-360 ES	2000	$30,000	56	900 LBS	150 KTS	±$118,000
2004 SR20-G2	200-HP CONTINENTAL IO-360 ES	2000	$30,000	56	900 LBS	152 KTS	±$130,000
2007 SR20-G2	200-HP CONTINENTAL IO-360 ES	2000	$30,000	56	900 LBS	152 KTS	±$160,000
2008 SR20-G3	200-HP CONTINENTAL IO-360 ES	2000	$30,000	56	900 LBS	152 KTS	±$170,000
2011 SR20	200-HP CONTINENTAL IO-360 ES	2000	$30,000	56	900 LBS	152 KTS	±$245,000

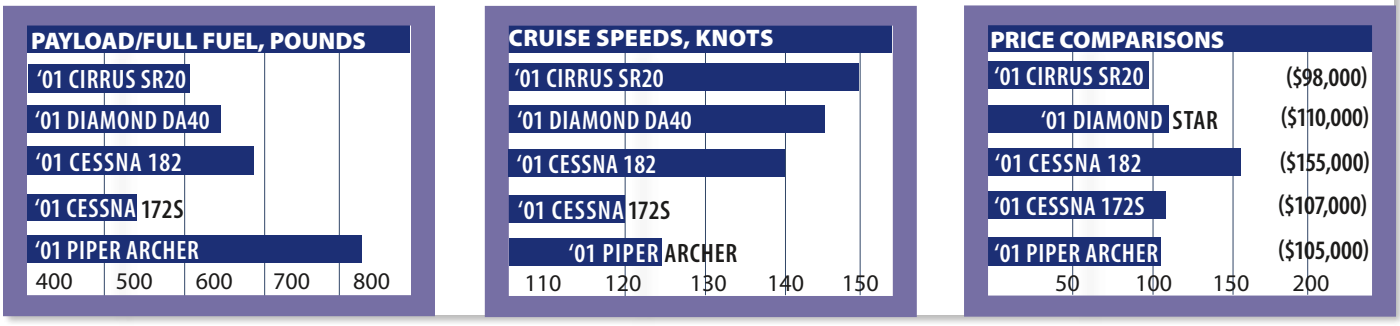
RESALE VALUES



SELECT RECENT ADs

AD 2009-05-05	INSPECTION OF PFD FOR CORRECT AIR DATA PERFORMANCE
AD 2008-14-13	UPPER CABIN DOOR ROD ENDS AND HINGE REPLACEMENT
AD 2008-11-18	HEAT EXCHANGER INSPECTION AND POSSIBLE REPLACEMENT
AD 2008-03-16	REDDER-AILERON INTERCONNECT RIGGING CHECK AND CORRECTION
AD 2007-14-03	REPLACE CAPS PICKUP COLLAR SUPPORT AND NYLON SCREWS

SELECT MODEL COMPARISONS



Cirrus interiors have come to set the standard for quality and room in the four-seat market.

The most innovative detail, however, and the one garnering all the attention in the months and years leading up to the SR20's certification, was the Klapmeiers' insistence every Cirrus sold would come with an airframe parachute as standard equipment. Their desire stemmed from a 1985 mid-air collision involving Alan Klapmeier, which resulted in the other pilot's death. Based on that experience, the Klapmeiers realized no matter how well-trained or experienced one might be, there were situations where there was nothing a pilot could do to save the airplane, himself or his passengers unless some kind of "whole-airplane" parachute was developed.

The Klapmeiers gambled the parachute would make their brainchildren stand out on the market and resolve much of the anxiety many passengers (and more than a few pilots) associate with personal aircraft. At the time, no one had proposed equipping an airplane as large and fast as the Cirrus with a ballistic parachute. Reaction was mixed, with many predicting the FAA would never sign off on the idea.

They were wrong. Cirrus worked with Ballistic Recovery Systems through a number of designs for what came to be known as the Cirrus Airframe Parachute System, or CAPS. The system exacts an 85-pound useful load penalty—and a recurring maintenance expense.

There is a six-year replacement on a pair of line cutters used in CAPS deployment that costs approximately $1500 total. That's cheap compared to the 10-year CAPS repack, which is over $9000 in parts, plus 30 hours of labor for pre-2004 aircraft and 8 hours for later ones. The difference comes from a CAPS access panel added in the G2 revision of the design. We covered repacks in detail in the December 2012 issue. We also noted the depreciation of airplanes as they come up on repack time may be greater than the cost of the repack itself.

The CAPS has proven successful in our mind at what it was designed to do: lower an airplane and its human cargo to the ground, giving both a chance to fly again. To date, according to the Cirrus Owners and Pilots Association (COPA), there have been 37 CAPS events in both SR20s and SR22s. COPA points to 77 lives saved aboard the 37 airplanes. Notably and despite lore to the contrary, deploying the 'chute does not automatically total the airplane. One of the first deployments involved an airplane whose aileron detached in flight. The pilot escaped without injury while the airplane was recovered, repaired and returned to service. In at least two other CAPS events, the airplanes were expected to be repairable.

The FAA granted a type certificate in late 1998, and the first airplanes were delivered as 1999 models. Cirrus initially offered the SR20 in three option tiers, originally designated A, B and C, which we'll explore in a moment. Today's offerings generally continue that theme, with the base airplane and upgrade packages, culminating in the GTS version.

Borrowing a page from Henry Ford, customers initially could order their Cirrus in any color they wanted, as long as it was white. This lack of color choices stemmed from an FAA-imposed limitation borne from a fear that darker, heat-absorbing colors would hasten the composite structure's deterioration. As experience was gained, darker colors have been allowed. Most early Cirri come in a white or ivory base paint, with multi-colored striping. Both the SR20 and the SR22 carry a 12,000-hour airframe life limit.

MODEL DIFFERENCES

Trimble bailed out of the light aircraft avionics market before the first Cirrus was shipped and Cirrus wisely adopted Garmin for its panels. The A-spec airplanes came with a GNS430, a GNC250XL, an audio panel and GTX320 transponder, plus the ARNAV ICDS 2000, a then state-of-the-art multifunction display, or MFD. For autopilots, the "A" aircraft have S-TEC System 20s, upgradeable to System 30s, which include altitude hold. All of the early aircraft used vacuum instruments but had an electric backup vacuum pump. Rounding out the panel are analog engine and systems gauges clustered on the far right.

Meanwhile, "B" airplanes have a GNS420 in place of the GNC250XL, the System 30 is the standard autopilot and a Century NSD360 vacuum/electric HSI is fitted in place of a vacuum-powered directional gyro. The C-spec airplanes have dual GNS430s, System 55 autopilots, dual alternators and a Century NSD1000 electric HSI. Options for the "B" included dual alternators, leather seats and three-blade propellers, with roughly 70 percent of SR20s being loaded "C" models.

Beginning with serial number 1268 and the 2003 model year, Cirrus did away with vacuum systems

With only 200 HP, the SR20's rate of climb drops off sharply when it's high and hot—owners tell us that it's easily managed with a little planning.

and introduced the all-electric airplane. The A, B and C designations evolved to 2.0, 2.1 and 2.2, respectively. The all-electric airplanes have dual alternators—a 75-amp main alternator and a 35-amp secondary unit—plus dual batteries. There also are two busses, a main bus and an essential bus for critical load items such as nav and comm functions and lighting.

The 2.0 airplane didn't change much over the old A airplane except in the case of the ARNAV ICDS 2000: Cirrus switched to the Avidyne EX3000C, a higher resolution MFD widely acknowledged as more sophisticated than the one it replaced, but—since it won't accept external sensors such as data from a remote-mounted Stormscope—one intended for the VFR or IFR-lite pilot. The all-electric 2.0 offered a DG, but most buyers opted for the NSD1000 HSI. The 2.1 airplanes have an Avidyne EX5000C and NSD1000 as standard, while the 2.2 airplanes featured a pair of Garmin GNS430s, the EX5000C and a Sandel SN3308 electronic HSI. Most airplanes delivered have the 2.2 package.

In early 2004, Cirrus introduced the G2 models of both the SR20 and the SR22, featuring a new door design, better interiors, a redesigned firewall for improved crashworthiness and other upgrades. Cirrus says G2 airplanes have slightly less drag and are thus a knot or two faster than previous models. Later that year, Cirrus began offering the SRV, a VFR-only model intended for the training and low-end market. It was discontinued by 2010. For 2008, the G3 SR20 variant was introduced, featuring the wing from the SR22 G3, redesigned landing gear and a 50-pound useful load increase, among other changes. The new wing added a few knots to the airplane.

In 2012, a flex seating arrangement was introduced for the rear seat; the 60/40 split allowed room for three passengers and for the seat back to fold down in sections.

Many would-be buyers might wonder if an early SR20 can be retrofitted with a PFD or if a vacuum model can be converted to an all-electric model. Cirrus says these upgrades aren't possible, but kits are available to replace the ARNAV ICDS 2000 with the more-capable Avidyne EX5000C, and many of the early aircraft have already had this upgrade. This change accommodates state-of-the-art options like displaying remote Stormscope and Skywatch data, incorporates EMAX engine monitoring, XM WX datalink and CMAX, Avidyne's electronic approach plate system.

Current SR20 models start with a Garmin G1000 panel using 10-inch PFD and MFD screens, dubbed Cirrus Perspective, and then add options like larger screens, XM WX, enhanced vision, lightning detection, and traffic or terrain warning.

ENGINE AND SYSTEMS

All SR20s have been fitted with the same engine since production began: the 200-HP six-cylinder Continental IO-360-ES. It's a somewhat unusual choice but one yielding sufficient power and remarkable smoothness. The engine's TBO is 2000 hours, but overhaul costs are on the high side, at about $30,000. Throttle and RPM control are done via a single lever that moves both cables. Full throttle will yield 2700 RPM. A reduction of power brings 2500 RPM, where it will stay until power is so reduced it can't be maintained.

This is done through a cable-and-cam arrangement that works well enough, but there's no way to find an RPM sweet spot. Some owners have complained about rigging difficulties and trouble getting precise power settings. Most of these airplanes have three-blade props, but those with two-blade props (especially in the early years) may have better weight and balance numbers without a hit to performance.

With the exception of aluminum control surfaces, the airframe is entirely composite. The wing is constructed with a beefy, continuous spar. Control surfaces are activated via cable from side controllers mounted on the cockpit walls. Trim is electric only, with coolie hat buttons on each stick, a sore spot for some owners, who say they would like a manual trim wheel for backup and fine tuning.

The Cirrus wing has a stepped leading edge that's supposed to stall the inboard section first—allowing roll control throughout—and be resistant to spinning. The airplane is not approved for spins, nor did it undergo official spin testing. If a spin develops, the first anti-spin response is roll input with ailerons, but the official response is deploying the parachute.

Cirrus airplanes are designed with crashworthiness in mind. The SR20's fuel supply, for example—60.5 gallons total, 56 gallons usable—is stored between the wing spars and well outboard of the cabin, providing significant crash protection. The landing gear is designed to absorb energy and flex into the wing inboard of the fuel cells, thus leaving them intact in the event of a hard landing or crash.

The seats are 26G-impact designs and each has four-point harnesses with inertial reels and airbags in the front seat shoulder harnesses on

SR20 Wrecks: Runway Mishaps Rule

A Cirrus has benign handling characteristics, although speed control is a prerequisite for success on landing. That's why we were a bit surprised that of the 50 SR20 crashes that we looked at over a 10-year span, 34 percent of them occurred around the runway—that's approaching tailwheel runway loss of control (RLOC) rates. While the little brother of the SR22 may have less power than its sibling, it's still a slippery airframe that demands attention in the runway environment.

The typical SR20 RLOC on landing might start with porpoising, followed by a nose wheel prang or hard bounce on the mains, resulting in a trip off the side of the runway. The victim of one such scenario was surprised because, according to the NTSB, he concluded that the accident landing wasn't any harder than some he'd made during training. Another SR20 pilot didn't live to talk about his landing gone bad—the aircraft struck a tree.

In our research, engine and mechanical problems came in second and included a catastrophic engine failure due to oil starvation brought about by excessive blow-by and cylinder detonation. Another oil starvation was the result of a missing drain plug. While there wasn't a pattern in the nine engine- and airframe accessory-related crashes we looked at, some were the result of the aircraft's early growing pains. This included a fire that originated at the right main landing gear brake caliber. Another was an attention-getting aileron/rudder jam that occurred during the takeoff roll. Cirrus ultimately issued (and made several changes to) a mandatory service bulletin that changed the rigging and some hardware in the controls until it ultimately became an AD.

There were four events of continued VFR in IMC which led to spatial disorientation, including one non-instrument-rated pilot who, during vectors to an ILS approach, told ATC he was IFR-qualified. He ultimately pulled the CAPS parachute after proving he wasn't as qualified as he thought. Another SR20 pilot failed to maintain control of the aircraft in IMC and reported a turn coordinator failure. That wasn't the only system that failed him. According to the NTSB, the pilot stated that he repeatedly pulled the CAPS activation handle, but it didn't deploy.

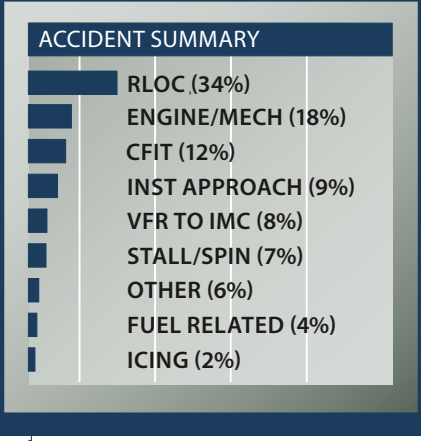
We were also reminded of New York Yankees pitcher Cory Lidle and his flight instructor who hit a Manhattan apartment building while maneuvering in a tight corridor above New York's East River.

When it comes to hitting things, 12 percent of the wrecks were the result of controlled flight into terrain, or CFIT. This is surprising to us, given the advanced electronics that are installed in most Cirrus panels. They were hyped as nearly miracle devices to increase situational awareness and prevent CFIT.

Some pilots did a lousy job on instrument approaches, botched a missed approach or descended too low on the approach and hit something.

Two SR20s hit wildlife on the runway and one was in a midair hit. We put these into the "other" category.

We couldn't find a smoking gun in our research. We did find that 16 crashes—or 32 percent—involved fatalities, proving that the SR20 may be an entry-level Cirrus, it still demands skill when landing, when on an instrument approach and when flying in the weather.



newer models. If the worst does happen, the airplanes come with a crash hammer so occupants can extract themselves. One major safety feature is the lack of yokes to impale front-seaters during a head-on impact.

PERFORMANCE, COMFORT

Performance-wise, the SR20 should be examined as both a high-performance airplane and as a fixed-gear cruiser. As a fixed-gear cruiser measured against the likes of the Cessna 172 or 182 or the Piper Archer, it's respectably fast. Although Cirrus initially claimed 160-knot cruise speeds, 145 knots for the older models to 155 knots for a G3 SR20 is more like it. Cirrus notes that a slow SR20 should be checked for proper rigging.

Although the SR20 is adequately powered, it's not overpowered. At 3050 pounds for the later versions, it's heavier than most airplanes with 200 HP. At moderate weights, expect 700 to 800 FPM initially, falling off to 500 FPM above 4000 feet. Given its weight and the power available, expect the airplane to be somewhat of a dog in high-density altitude situations. Owners say the POH is on target for fuel burn at about 10.5 GPH for typical cruise, 9.0 GPH when lean of peak. Still-air range is about 675 miles, with 45-minute reserve, when planning to use the full 56 gallons legally available. Down-fueling to the tabs allows more cabin load, but dramatically cuts endurance to less than two hours.

Initial max weight for the SR20 was 2900 pounds but a later service bulletin, if complied with, allowed a gross of 3000 pounds. The SR20 G3, meanwhile, has a max gross of 3050. Cirrus initially claimed a standard empty weight of 1875 pounds for a useful load of just over 1025 pounds.

Not really, say owners. Empty weights are typically 2000 pounds or more with useful loads of just under 900 pounds. With full fuel, that leaves 560 pounds for people and stuff. CG tends forward rather than aft. This requires heads-up flying, for the airplane is not blessed with an overabundance of elevator authority.

Both the front and back seats of the airplane are exceptionally comfortable by GA standards. With no yoke to obstruct the view, the front seats are like flying from an easy

Mispositioning the oil dipstick (yellow handle to left of oil filler cap) can result in an oil quantity indication as much as 1.5 quarts in error. Correct position is shown.

chair, with an expansive view out the generous side windows. The side-yoke controller is easy to adapt to by using a rest provided for your forearm. The airplane generally rivals the Bonanza in handling ease.

SERVICE HISTORY

Cirrus largely achieved its goal of building a low-maintenance airplane. There are 11 ADs on the airframe, two or which relate to minor issues with the parachute firing mechanism. Initial problems with hard starting of the IO-360 and failed starters were addressed with tweaks to the fuel system. Early models had landing lights mounted on the cooling baffling in the air inlet, which caused them to fail frequently. The mount was reworked and newer models have the light in the cowling.

A search of Service Difficulty Reports discovered fewer than 20. There were only two recurring themes: cracked spinner bulkheads and chafing ignition system wiring.

Owner complaints included an engine eating cylinders, fuel pumps and alternators not lasting and several Garmin and Avidyne repairs. One owner commented on 10,000-hour Mean Time Between Failure promises he'd heard for the glass cockpit equipment before buying and considers them to be nowhere close to reality.

Pre-G3 era fuel gauging was criticized, with one owner strongly recommending the CiES digital fuel sender retrofit.

Another issue, and one resulting in AD 2006-21-03, involves the brakes. Since all Cirrus models have free-castering nosewheels, directional control at low speed is done via differential braking. Some pilots may have used the brakes to control taxi speed instead of reducing power. The predictable result: overheated brakes, leaking fluid and the occasional fire. Depending on serial number, the AD calls for a one-time O-ring or caliper replacement, plus trimming the wheel fairings, installing temperature indicators and inspection holes.

An AD issued in 2008 (AD 2008-11-18) requires a 100-hour pressure-test inspection of the exhaust systems installed on early SR20s, serial numbers up to 1815. Carbon monoxide can leak into the cabin from cracked components, potentially disabling the pilot. We're not aware of an alternative method of compliance.

None of the owners who have been through a couple of annuals and contacted us reported unusual costs. Note, of course, the ADs issued against the airplane so far have not involved the composite structure but, instead, involve systems or accessories. It's still too soon to say that composite airframes are less maintenance-intensive than their metal forebears, but indications so far are positive. Certainly, corrosion will not be an issue, but problems unique to composites may take decades to surface.

TYPE CLUB

As for type-club support, you can't get much better organized than the Cirrus Owners and Pilots Association (COPA). The organization maintains an excellent website (www.cirruspilots.org) with both public access and members-only forum sections. It's a must for any would-be Cirrus buyer.

OWNER COMMENTS

I bought a 2009 SR20 Perspective new. In 1250 hours on the airplane, I've had some minor equipment

Clean lines explain why the SR20 is as fast or faster than retracts with the same power. Large wheel pants make adding air to the tires a challenge.

issues: engine-driven fuel pump, electrical fuel pump, both alternators, two starters and two cylinders. The avionics have been reliable, although during a Perspective upgrade the incorrect value was selected for the type of oil temperature sender, resulting in high oil temp messages. The $500 sender was replaced as the first of what proved to be a lot of work to find the true problem.

The fuel gauges stink. I installed the digital CiES senders and recommend the change. I also like the LoPresti IceSkates wheel pants and BoomBeam landing light upgrade.

The airframe is strong—after hitting a deer on landing, there was only minor damage to the wing leading edge; repairs were cosmetic.

Jeff Bassett
Via email

I have owned an SR20 since October 2002 and currently have 2042 hours on the original engine—with good compression and low oil consumption. It will come close to book speed, but I fly at 140 knots LOP at 9.8 GPH. At 49 inches wide, the cockpit is very roomy, a pleasure after years in a Cessna 172.

Both alternators have been overhauled twice, as has the starter adaptor. The airplane has round gauges, WAAS, Skywatch, a Stormscope, LoPresti landing light and HID TriTip wing lights. I've had many Garmin and Avidyne repairs. 10,000-hour MTBF? Not a chance. I don't buy avionics insurance, as it would add about $10 per flight hour. The vacuum pump went at 1100 hours, but the electric backup kicked in seamlessly.

I constantly hear how difficult this plane is to land and that it's impossible to fly slowly. It's not true. It can be trimmed to fly hands off at Skyhawk speeds. Good landings are definitely speed sensitive, and new pilots to Cirrus are strongly advised to get some time with a Cirrus instructor.

Rick Beach of COPA has reams of documentation on the advantages of using the parachute versus trying an off-field landing. Prudent Cirrus pilots should join COPA to learn the good and bad of these airplanes.

What my SR20 doesn't do well is climb in warm weather—but it is a joy to fly in cool weather and a pleasure to fly in IMC. If asked if I would buy another SR20, I'd say "yes" in a heartbeat. Would I upgrade to an SR22? No—other than climb rate, nothing is missing. The SR20 is nearly perfect for my needs; if it had a diesel, it would be perfect.

John Dolan
Via email

I moved from a Warrior to a 2002 SR20 in September 2012. The things I like include the comfort of the cockpit; the side yoke, because it opens up so much more of the panel; CAPS, because it is insurance when everything else is exhausted (plus, my wife loves it). Also, it's fast—it cruises at 140 knots and only burns 9 GPH; the MFD is great for situational awareness; and it's easy to fly after you get transition training from a Cirrus instructor.

I don't like the lack of ice protection—my next airplane will be an SR22 with TKS; maintenance cost—at $2500 for an annual, it's twice what my Warrior cost; and the wheel pants make it difficult to add air to the tires.

I would buy this airplane again. I really love to fly it. Interestingly, pulling up in a Cirrus seems to draw quite a bit of attention, and I feel like I am treated better by ground personnel.

Anthony Sobczak
Via email

I owned a SR20 G3 GTS for over three years and loved every minute of the experience. I recently traded up to a new SR22T-G5.

I finished up my private in the SR20 and got my instrument rating in it. I flew the airplane to Alaska; it is a great traveling machine. The interior is unbelievably comfortable.

The cost to keep full updates on the avionics ran $1443 for the U.S. or $1870 for the Americas. Running LOP, fuel burn was just over 8 GPH. My most expensive annual was $4200; insurance for a $2 million smooth policy was $3970.

There are some who say the airplane is hard to land. It's not with a proper checkout and proper speed control.

Robert Sugar
Via email

The SR20 is comfortable, has decent speed and is an excellent IFR platform. With a CAPS repack, mine has averaged $30,000 (Australian) annually to operate—for absolutely everything. Weak points are cylinder life and wheel fairing brackets.

Clyde Stubbs
Via email

2013 EDITORIAL INDEX

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The Aviation Consumer

Twin Market

(continued from page 17)

E1C4 engines run $55,000 for overhaul and the airplane, despite looking terrific, is draggy. We don't know if the rumor on the street about it intentionally being designed to be slower than the King Air 90 is true, but it does cause one to ponder.

The Cessna 340, once equipped with VGs and a gross weight increase, goes from a load-challenged machine to a very nice, personal hotrod. With virtually the same engines as the 414, the smaller—but still comfortable—cabin means it's faster. Values run from $120,000 to $230,000 in its 1972 to 1984 production run.

The Cessna 414 has the Cadillac-handling of the 400-series Cessnas, and the larger cabin it shares with the 421. Both had long production runs—values of the 414 range from $110,000 through $375,000—and the 421, with its near turboprop speed ranges in value from $95,000 through $430,000.

Beware the care and feeding of the GTSIO engine on the 421s—they do not suffer misuse lightly and overhaul runs $47,000. Buying a 421 and discovering it had "issues" has proven financially catastrophic to more than one optimistic owner.

Watch for corrosion and look at 340s carefully—for some reason we've seen a surprising percentage that appeared to have been run hard and put away wet too often.

The Navajo proved to be a winner for Piper and owners, with good handling, decent speed and a comfortable cabin. The pressurized version, with 425-HP engines that cost $50,000 to overhaul, did not get rave reviews, which is reflected in the current values—$110,000 for a 1970 edition, through $165,000 for the 1977 version. We'd stay away. The Mojave, produced for only the 1984 model year, with 350 HP a side, is valued at $305,000.

The Aerostar line, the fastest of the twins, was the brainchild of the design genius Ted Smith. What aficionados refer to as design features, others call quirks. Regardless of terminology, Aerostars go like crazy and require that a pilot be on the top of his or her game as well as be willing to assertively stay on top of maintenance.

The pressurized 601P will outrun some turboprop twins while burning 40 GPH rich of peak. We think that the 601P line is slightly undervalued at a range of $120,000 to $180,000. However, we recommend a potential buyer go in with eyes wide open, join the owners organization, make certain there's a maintenance technician nearby who knows the ins and outs of the breed and be prepared to take serious recurrent training.

The only single that compares with the pressurized, cabin-class twins is the Piper Malibu/Mirage. With a value range starting at $215,000 and going up to $1 million, it provides a great deal of food for thought for the potential buyer of a pressurized piston airplane. A buyer who has the wherewithal to spend $400,00 on an airplane and desires pressurization can find a very nice Malibu or Mirage. For the same money, he or she can buy a pressurized twin with mid-time engines, spend $70,000 to refurbish it, fuel and maintain it for several years, and carry more in greater comfort while going as fast or faster. We think it makes sense.

CONCLUSION

Is it time to buy a twin? If you want to fly inexpensively, or even for what some would call a reasonable amount of money, no.

For the pilot who has a need to travel some distance and deal with weather, wants comfort and recognizes that to get speed and capability in an airplane, there's no free lunch, a light-light twin probably isn't worth the total cost, but a light or pressurized twin may prove to be precisely the right airplane.

FEEDBACK WANTED

PITTS SPECIAL

For the March 2014 issue of *Aviation Consumer,* our Used Aircraft Guide will be on the production versions of the Pitts Special series, the one- and two-place tailwheel biplanes renowned for their aerobatic abilities. If you've flown or owned one, we want to know about your experience: how much they cost to operate, maintain and insure and what they're like to fly. If you'd like your airplane to appear in the magazine, send us any photographs you'd care to share. We accept digital photos e-mailed to the address below. We welcome information on mods, support organizations or any other pertinent comments. Please send correspondence on the Pitts Special series by January 1, 2014, to:

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