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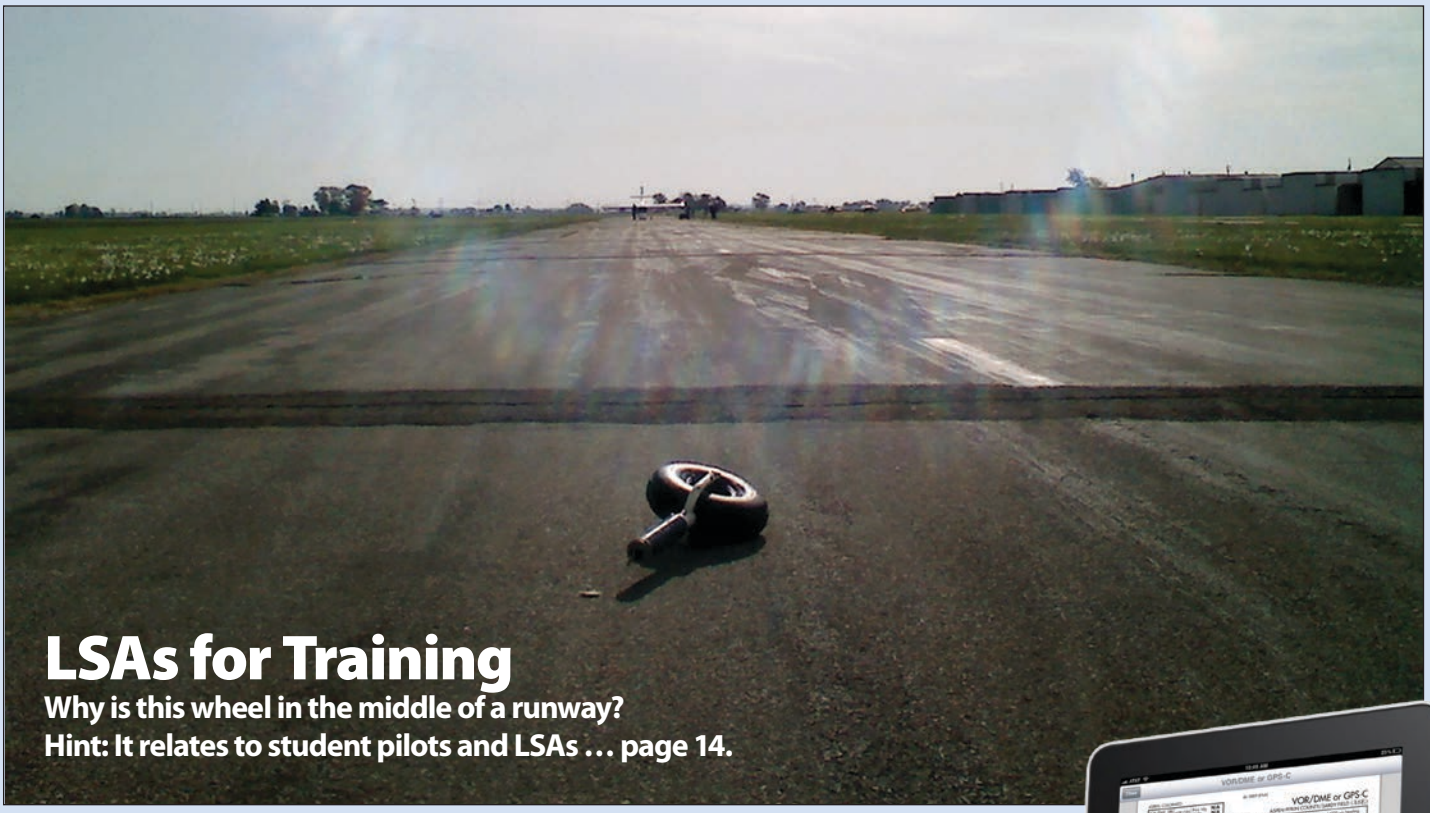

LSAs for Training

Why is this wheel in the middle of a runway?
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The Aviation Consumer

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Are We At the 100LL Tipping Point?

It sure seems like it to me. Just in the past couple of months, I 'm seeing a scramble of activity, including major initiatives from both Continental and Lycoming, a new engine idea from South Africa, a new model from Cirrus pitched to burn low-octane fuel and a rising fish-or-cut-bait sense from aircraft owners and pilots. At Continental, Johnny Doo, the new VP for engineering, told the visiting press last month that the EPA's initiatives to remove lead from aviation gasoline may seem like a long way off—2015 to 2017—but as the fuel research effort continues to drift, time is shorter than anyone thinks. The manufacturers are trying to rapidly line up their options to deal with a future fuel situation that they simply can't predict.

Every time I visit Continental or Lycoming—and I did both last month—I'm struck by one thing: These are tiny businesses. They're not Mom and Pop groceries, to be sure, but they're hardly Intel or Ford or even Sam Adams brewery, whose annual revenues outstrip Continental threefold. So despite being part of larger conglomerates, they aren't swimming in capital, which explains why major developmental projects are rare and why they tend to telescope over long periods, running on a cheaper low boil rather than the high-budget speed of heat.

I am not encouraged. Increasingly, I think the future fuel challenge defies solution not for technical reasons, but for political and internecine, interorganizational squabbling. It's almost as if the quest has become an end in itself and the solution has become untouchable because it will leave a big vacuum with nothing to do.

Against this backdrop, both Lycoming and Continental are moving forward with (relatively) big dollar developmental work—Lycoming with its IE^2 engine and Continental with a diesel project—intended to ready them for whatever fuel emerges as The One. Although the timing for both looks good, they are risky projects because no one knows if customers will resonate with these ideas. And therein lies the core of the problem. Pilots love to bash "Lycosaurus" for their lack of innovation but the record suggests otherwise.

More than 20 years ago, Lycoming flirted with John Deere to develop a heavy fuel rotary and it did again with Detroit Diesel more recently. Both projects were dropped. Continental is no stranger to technological risk. Remember the Voyager engine? If you think the Voyager wasn't innovative, consider this: It was water-cooled, had high turbulence combustion chambers and a compression ratio of 11.4 to 1. In the 300-cubic-inch version, it demonstrated a BSFC of .345, which is better than the diesel technology Continental has acquired from SMA.

There are other cratered engine projects, not the least of which is the Thielert diesel. A good idea badly managed, maybe, but it basically tanked anyway. Let's not forget Rotax's aborted project on V-6 engines that weren't lighter than the existing competition, didn't produce more power and were complex. Other than the fact that nobody wanted these engines, they were smash hits.

Mature aircraft engines are in the sweet spot of cost, efficiency and power density. It's unfair and inaccurate to say neither Continental nor Lycoming haven't tried to better these designs. They have. You could argue that the companies haven't done the right kind of innovation, but if that's true, where's the competition that has? (See above, Rotax, Thielert. See the report on page 4…)

Customers—mainly end users, but also OEMs—have decried the lack of innovative products. Yet when the engine makers have pitched new stuff, the very same customers have demurred, preferring to stick with the proven, the familiar, the reliable. Whether we're in for a sea change due to threatened fuel supplies is unknown at this point. But it sure looks real to me. *–Paul Bertorelli*

Who Made Them King?

When the specifications for LSAs were first announced, I was disappointed that there was a maximum gross weight limit. This limit is so restrictive that few LSAs have reasonable useful loads. To be functional, I think a two-seat airplane should have enough carrying capacity to put two adult males and enough fuel for three or four hours flying in them.

More important, for the growth of the pilot population, the weight limit eliminated two of the most popular aircraft that should be in the category, the Cessna 150 and Citabria. Until I read your article in the May 2010 issue of *Aviation Consumer*, I didn't know the reason for this limit.

Well, my disappointment turned to anger when I read the quote of Earl Lawrence of the EAA, "We specifically excluded some of the heavier legacy airplanes because we wanted to encourage the development of new airplanes and new products."

So, who is this "we" and who died and made them king? To take this position and leave huge numbers of potentially inexpensive LSAs out of the lineup is outrageous. Sounds like the group did the bidding of the manufacturers to the detriment of the potential pilot population.

A couple of years ago, some of the alphabet groups announced they were going to attempt to get the FAA to increase this gross weight limit. I believe EAA and AOPA were among the participants in this drive. Since the initial announcement, I haven't heard anything more. Do you know anything more about this and its status?

Actually, I once got an answer to my query of why there was a weight limit. A person associated with LAMA told me it was to keep the planes from getting too complex. I would ask him, "Have you seen the avionics in LSAs?" I don't think a weight limit is going to keep them from getting too complicated.

Until we see a truly inexpensive way to learn to fly, there won't be the numbers of new pilots necessary to turn the tide on the dwindling pilot population.

Ed Fogle
Claremore, Oklahoma

Avidyne Replies

We thought the review of the Avidyne EX600 was a fair and accurate assessment and you clearly conveyed all the features and benefits that make this a great product.

We think a couple of items are worthy of comment. Regarding the issue you mentioned about "repeatedly pounding the left pan button" and it panning slower than expected, the panning works best if you just push and hold. You will get a smooth pan that stops immediately when you let up, as described in the Pilot's Guide. As you saw, it doesn't work as well when you repeatedly push the pan button.

The EX600 has integrated cooling fans and doesn't require external cooling. You and I both know that you can never have enough cooling fans, but the comments in your cutline suggest external cooling is required with the EX600 and it is not, nor is heat a particular issue with this box.

Tom Harper
Director, Marketing
Avidyne Corporation
Lincoln, Massachusetts

TCM's Diesel

We think TCM is making a mistake by not developing a two-stroke liquid-cooled diesel of their own. I don't know of any of my fly buddies who are interested in the current TCM design copy of SMA because it's not meeting any of the criteria of what we want—save one, it's a diesel. Is it possible that SMA could not sell their engine to anyone who still has a choice, just because of its basic design? And is it possible that TCM just made a big mistake?

Those of us with a basic mechanical knowledge agree that we will not be readily accepting of the SMA type engine, especially when there are a couple of alternatives available that do not have a valve train to wear out, nor require a massive unappealing front cowling with all of its air scoops, plus it has hardware hanging underneath that blocks nosegear from retracting. If TCM proceeds with a 350-HP version, it doesn't appear to me that it will work in my Malibu, unless the hardware underneath is relocated.We all did the math and converting to any diesel does save money to pay for all of the extra costs for a retrofit, including the cost of the engine, all within one TBO or TBR, and then after that, it really starts paying for itself many times over. But wouldn't it be better to wait for the DeltaHawk or at least something like it?

Name withheld

I was very glad to see the detailed article in the May issue about getting

continued on page 32

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Heavy fuel engines will play a role in Continental's future, left. In May, it announced a new diesel development project based on SMA's four-cycle technology. It's aggressively pursuing 94UL as a 100LL replacement.

FUTURE POWER

Engines of Change: Fuel's Driving (Or Not)

Lycoming and Continental have very different visions of what should replace 100LL. But both agree on one thing: Persistent delay threatens the industry.

by Paul Bertorelli

To visit Lycoming and Continental, as we did last month, is to step into a disconnected world that almost qualifies as an alternate reality. And no, we're not resurrecting the hackneyed complaint that the engine companies are out of touch with the wants and needs of their customers. It's the other way around.

While the world of piston GA drifts along in business-as-usual mode, the engine makers see a looming cliff defined by the extinction of 100LL and no one is tapping the brakes. Panic may be too strong, but if no universal fuel replacement emerges two years from now, it may be too mild.

We'll frame it this way: Buyers, owners, user groups and the alphabets may see the elimination of 100LL as being at least five to seven years distant and can thus pencil the problem into tomorrow's to-do list.

While GA dithers, Lycoming and Continental are sensing they're late for the office.

But the engine makers will shoulder the technical burden of building engines to run on unleaded fuel. They live in a world of lukewarm, sometimes vaporous demand, of a legacy fleet that's all but inextricably wrapped around a 100-octane fuel requirement and of certification projects that consume months and years and that require limited capital to be doled out in squirts, not torrents. High-dollar crash projects aren't on the agenda. That means while the world continues to snooze, Lycoming and Continental are sensing they're running late to the office. Because neither company knows what will replace leaded avgas, designing for the future requires a lot of what-if development that may become tomorrow's never-was skunk works curiosities. Who's got the money for that?

Lycoming and Continental have divergent approaches to this conundrum. Continental is pushing for a quick-start 94-octane unleaded solution and just announced a diesel development project. Lycoming is agnostic on the diesel idea, is moving aggressively forward with a state-of-the-art electronic engine but is adamant about one thing: Any replacement of 100LL avgas needs to have a minimum of 100 octane. It thinks the industry should get serious about considering 100-octane solutions.

Both companies agree on two things: We need a decision sooner rather than later and the more we delay and dither, the longer it will take Lycoming and Continental to generate the engines buyers will expect. Lycoming especially sees delay itself as an existential threat.

TCM: EARLY START

The notion that 100LL would vanish has a long tail, extending back to at least the mid-1980s. But the idea was all tail and no teeth because the aviation industry has been granted recurring exception to the clean air legislation that indirectly began the phase out of leaded mogas.

Continental was an early swimmer against the do-nothing tide. In 1998, it bought a small start-up company called Aerosance (originally Aerotronics) which had developed full authority digital engine controls built around

TCM test beds but applicable to any aircraft engine. One driver of that work—if not the main driver—was automotive-style variable timing and pulsed fuel injection that allows high horsepower engines to burn lower octane fuel.

TCM invested enough to certify the system for a number of engine/aircraft combinations but found disinterest in the market. Only one OEM—tiny Liberty Aircraft—offers what has become the TCM PowerLink on new aircraft. There have been a handful of conversions and experimental installations, but fewer than 100 are flying. Nonetheless, TCM says six OEMs have PowerLink launch programs and nine engine families are certified with it. The market may be swinging in TCM's direction.

Bullish as it was on early development of alternate fuels, in 1997 TCM also took a NASA grant under the General Aviation Propulsion project to develop a proof-of-concept diesel. The result was a compact four-cylinder, two-cycle design that ran in the test cell and flew on a Cessna 337 in 2000. But TCM saw that market as soft, too, and declined to move the engine into production. It still has the engine in its research shop.

Fast forward to 2010 and TCM is moving on several fronts. It has a new management team led by Rhett Ross and a new engineering and manufacturing staff. It's pushing hard on the idea that 94UL—a fuel somewhat similar to 100LL without the lead—can serve as a drop-in avgas replacement.

TCM is focusing research on proving that all of its engines can run on 94UL, either with no modifications, through the installation of lower compression pistons, power output limitations, variable timed magnetos or the ready-to-go PowerLink FADEC. TCM has continued to invest in expanding the list of its engines that have a PowerLink version available. When OEMs come asking, TCM wants to be ready.

HEAVY FUEL

TCM sees the same energy trends everyone else does and knows that overall gasoline demand is flat, 100LL demand is declining and Jet A looks like the global fuel of the future. Still, they surprised us in May by announcing a new diesel project based on technology bought from France's SMA.

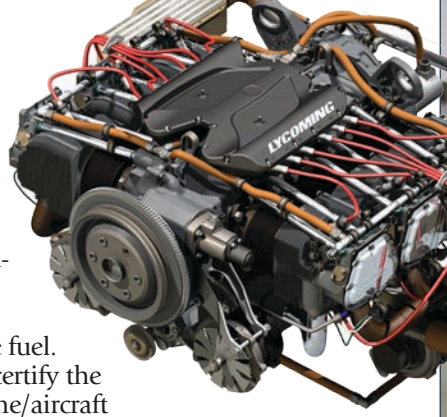
In the test cell and on a Cessna 182, they showed us test articles clearly based on the SR305, a four-cylinder, four-cycle 230-HP engine that's been flying since 1998 but, like Continental's homegrown FADEC, hasn't gained much OEM traction. (See the February 2010 issue of *Aviation Consumer* for a full report.)

The engine's numbers—fuel specifics, power density, cost—make it an in-range drop-in for some of TCM's gasoline engines, but its long-term durability and economics are still unknown. In other words, TCM is taking substantial risk. There's no license deal with SMA, but rather an intellectual property purchase, meaning TCM can move forward as it sees fit and will do so, planning to develop the high-power six-cylinder powerplants that are the core of the profitable GA market.

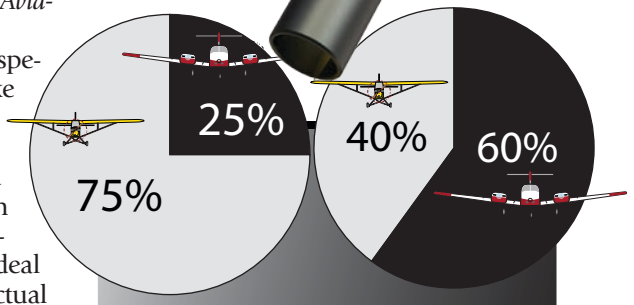
That TCM sees urgency in this project was implicit when we asked engineering VP Johnny Doo why the company bought the technology rather than developing it: time to market. Continental thinks demand for heavy fuel piston engines could outstrip its ability to develop them and, as with avgas solutions, it wants to be ready.

LYCOMING: A DIFFERENT VIEW

Lycoming's new CEO, Mike Kraft, couldn't see things any differently. An engineer by training, Kraft distills the avgas challenge as a force vector problem bounded by fragile economics with the potential for a sharp downward market spiral if the wrong



Lycoming's Mike Kraft, right, believes the 100LL replacement challenge is inextricably linked to engines designed to run only on 100 ocatane fuels. Even new-tech projects like Lycoming's IE² won't change that. "You can work the margins of the problem, but a control system around existing engines is not a panacea for a six- to nine-octane drop."



AIRCRAFT FUEL USED

Although estimates vary, this graphic depicts aircraft requiring 100-octane on the left (25%). On the right, those same aircraft burn at least 60% of all aviation gasoline. They are largely composed of commercial, for-hire and fleet operators, but also a large number of private owners.

Lycoming, left, and Continental, lower photo, rely on business generated by the legacy fleet. Both factories invest what they can afford in modernization.

fuel is chosen. He is plain about one thing: without a unified voice, the industry could default to the wrong choice with an impact in the billions.

Although Continental is willing to make the bet that owners whose engines won't operate on 94UL will either accept reduced performance or modify them to burn lower octane fuel, Kraft doesn't buy this. While it's generally accepted that a small portion of the total fleet—Kraft uses 25 percent—burns most of the avgas (60 percent), what's most important is who those owners are.

They're freight haulers, charter operators, small corporate flight ops and the like whose margins are already stretched. If they're asked to invest in engine modifications and/or sign on to reduced performance just to burn 94UL or something less that 100 octane, Kraft argues that many will simply bolt from aviation.

Some twins, for example, wouldn't meet their original single-engine climb requirements with octane-reduced power limits and would effectively become scrap. It may be a leap of faith to assume these operators will pay *anything* just to stay in the game. After all, TCM got an unmistakable early market thumbs down on PowerLink.

The larger worry, says Kraft, is the unknown effect this might have on the macro economics of aviation fuel, whose volume has already declined to the point that the oil industry ranks it as a specialty chemical rather than a fuel. If a significant exodus ignites a sharp decline, refiners may decide it's not worth the bother and fewer refiners will mean less competition.

The effect on prices will be obvious and could lead to a closed feedback loop of more owner dropouts and yet higher fuel prices, ultimately reducing GA to a high-dollar recreational market for the very rich, with no meaningful commercial component.

Lycoming's view is that the only smart solution is an unleaded replacement that has 100 octane or better. Ideally, this would be a drop-in requiring no aircraft or engine mods, something that Lycoming sees as all but a non-starter as a primary solution to 100LL's demise. Interestingly, says Kraft, even Lycoming's new-tech IE^2 engine is not being billed as panacea for a low-octane fuel.

"When Lycoming looks at this, it's not about the new engine and what we can do, but about the existing market and what the expectations are of getting value out of their assets. You have to be honest. You can't change the laws of physics. You can work the margins of the problem, but a control system around an existing engines is not a panacea for a six to nine octane drop. You can do so much, then you're going to have to de-rate," Kraft says.

Lycoming believes at least four entities have demonstrated 100-octane fuel, including Swift Fuel and GAMI's G100. To Lycoming, it's not whether unleaded 100 octane is possible or whether it's a biofuel or a petroleum-based fuel, but rather getting sufficient market attention from end users to first understand the significant impact lower-octane fuels will have and then to stimulate the demand necessary to attract the investment required to develop a 100-octane solution.

DIESEL? NOT YET

During our discussions with Kraft, he flashed a slide comparing diesel or heavy fuel engines to gasoline engines. The analysis yielded the same conclusion we've come to on our own: diesels have lower power density than gasoline engines and they're more expensive to produce. Although they're more economical than gasoline engines, the large unknown is service history and long-term durability.

Lycoming has pursued heavy fuel engines at least three times in its history: a rotary design with John Deere (dropped), a piston effort with Detroit Diesel (dropped) and a third in-house project, also dropped. The harsh reality is that *no* aircraft diesel has ever proven an unqualified market success, not the German Jumo, not the Packard radial, not the SMA and certainly not the Thielert line.

Those engines had technical issues and the company went bankrupt, morphing into Centurion. It's unknown if improvements will turn

SEE AND HEAR MORE TV

For a complete video and audio series on related topics—including a podcast interviews with Michael Kraft and TCM's Bill Brogdan on the fuel issue, a look at at the IE2 engine and a detailed report on the TCM diesel project—log onto www.avweb.com and click the audio or video buttons in the upper right of the home page.

them around.

Further, Lycoming sees trouble in emerging specs for biodiesel that may reduce cetane values for Jet A. (Cetane content describes the ignition reaction speed of heavy fuels.) There currently are no cetane requirements for Jet A—it's present as a happy accident—and if biofuel becomes a player, cetane could drop lower than it already is. Jet A typically has 40 to 50 cetane, while road diesel is higher. If reformulated synthetic Jet A has less cetane—some sources quote figures in the 20s—Lycoming sees the piston industry as the ant and Jet A users as the elephant. Piston GA would have little voice in the fuel spec and because Lycoming doesn't like those odds, it's demurring on a heavy fuel engine for now.

CONCLUSION

Both Lycoming and Continental agree that the demise of 100LL is a more immediate existential threat than aircraft owners and especially groups like AOPA and EAA seem to accept. That's because those entities don't have to build and sell products sharply constrained by market expectations on one hand and the laws of physics on the other. And they have to do this in an aviation economy battered to a virtual pulp.

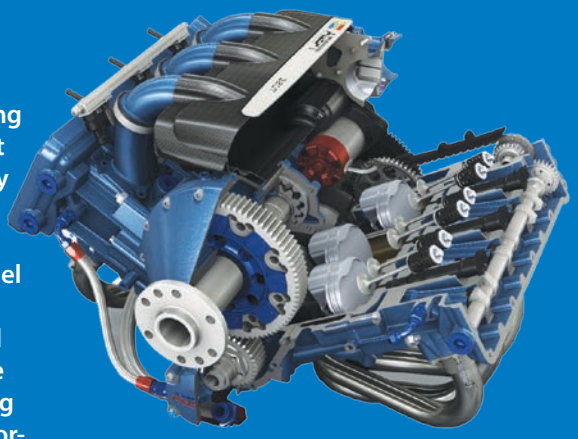
But both companies are placing very different bets on the future. Continental believes that it can develop a range of technical solutions so engines can operate on 94UL and that customers will either buy these solutions or accept reduced performance. Or both. It further believes that heavy fuel is an inevitable future player and is investing accordingly.

While TCM is willing to sacrifice six octane points for a rapid, agreed-upon solution, Lycoming believes a rush to accept 94UL will be a billion-dollar mistake. While it agrees that high horsepower engines might operate on 94UL, it also insists that end users—the ones who will feel the impact—don't yet understand how seriously performance will be degraded by anything less than 100 octane. Lycoming likes GAMA's idea of transitioning to 100 ultra low lead first, then a lead-free fuel after that.

Who's right? Based on our surveys, we think Lycoming may have the more compelling argument. We've seen detonation profiles on even 98-octane fuel that leaves us unconvinced that 94UL is really up to the job for a large enough segment of the GA fleet to be a practical choice. In our surveys, an alarming number of owners are telling us they'll get out of aviation rather than modify their engines to run lower octane fuel and it won't take many of them to actually do that to put avgas demand into a worrisome spiral.

As for diesel, both companies are looking at the same numbers and interpreting them differently. It's as clear an example of different business cases as you're likely to see. We see Continental's diesel play as sensible and rational, albeit risky. Lycoming's decision to sit diesel out for now has risk, too, but the far larger one is failing to develop an aviation gasoline that's not a drop-in replacement for 100LL. Lycoming's clear focus is to make the world of GA understand that without the distraction of adding Jet A to the list.

RETURN OF THE V



Just as Continental was surprising us with its diesel announcement in May, a South African company called Adept Airmotive was preparing a surprise of its own: the rollout of a new V-6 multi-fuel engine for the GA market.

Even casual readers will recall that Rotax/Bombardier tried the same thing in 2003 that was long on PR and short on market performance. Curiously, the two engines are related. Adept principle Richard Schulz was involved with a company developing a V-6, technology it sold to outboard motor manufacturer OMC. That company was bought by Bombardier and—surprise—the V-6 appeared as a proposed aircraft engine. It went nowhere, largely, we believe, due to lack of OEM interest.

Adept's retooling of the V-6 is a 320-HP turbocharged design that will run on a range of fuels from high-octane mogas to biofuels, although no details were given on what exactly biofuels means. We doubt it means heavy fuels.

At least three models are planned: a turbocharged 320-HP version and normally aspirated 260 to 300 HP versions. The engine has a 120-degree V—giving it an unusually low profile—and the dual overhead camshafts that are common in automotive designs. Like modern motorcycles, it has bucket-type valve adjustors.

Because it generates its best torque output at about 5000 RPM, the engine has a front-mounted gear reduction unit protected by an anti-backlash coupling.

As you'd expect, the engine is managed by dual-channel FADEC and has direct-fire coils similar to modern motorcycles. Cooling is via water and oil and Schulz told us the engine can run for long periods even with loss of coolant, relying only on secondary cooling from oil.

One persistent problem with V designs is overall weight and power density. Adept concedes the theory, but not the practice. The 320-HP model weighs 321 pounds, for an even 1.0 pound per horsepower, compared to 470 pounds (1.3 LB/HP) for a TSIO-550-K. (We reserve judgment on this until we've seen real-world installed weights for the Adept engine.)

How about fuel specifics? Schulz reports initial test reveals of .4, which is comparable with Continental's best. But he also claims testing shows that .37 is in range. That would be a significant development for a gasoline engine. The engine hadn't flown as of late May, but was about to in an experimental Ravin. For a full interview with Schulz, see http://snipurl.com/x5lb1 and adeptairmotive.com.

Aviation Apps for iPad: A Cut Above Phones

We're not wetting our pants with excitement, but the iPad definitely has EFB aspirations, with dozens of useful apps. But GPS navigation isn't one of them.

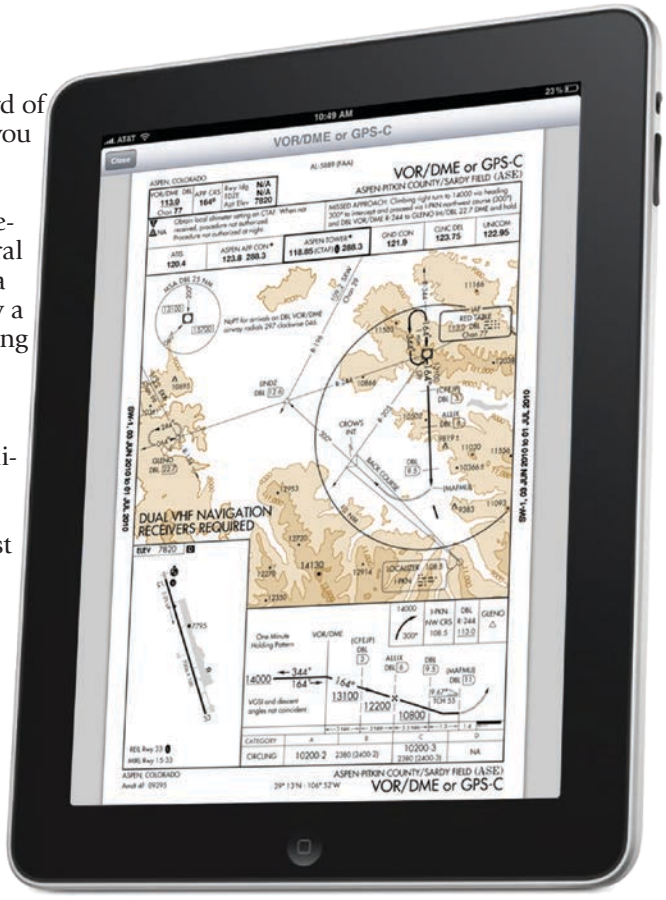
by Paul Bertorelli

Just for fun, I'm writing this article on the virtual keyboard of Apple's vauned iPad and, as you can see, it,s not going that we;;

Switching back to a real keyboard, I can now explain that despite the hype, the iPad for general use and for aviation use will do a lot of things adequately, but only a handful of things well. Composing text isn't one of them.

By early June 2010, there were more than 300 aviation apps for the iPad, but the number is technically less because some of those are iPhone apps that will run on the larger device and some are just variations on the same program, such as multiple checklists or POHs.

The iPad may be many things to many people, but there are several things it is not: a moving map, a good navigator or a datalink weather display. I doubt if Garmin will even feel a minor nick in sales from iPad competition. The iPad is, however,



iPad in actual size. Clip here and tape to panel. (If you can find room.)

an excellent plate reader. There are several ways to obtain and manage plates and I'm sure this function will improve as the market matures. It can also do enroute charts and sectionals reasonably well and it flat aces things like weight and balance and E6B calcs.

HARDWARE

Although some buyers are salivating at the idea of the iPad becoming the mother of all EFBs, don't hold your breath. It has some issues. First is size. At 9.5 by 7.5 inches, the thing is huge and it tends to consume the cockpit. That leaves a lap or kneemount as the best option. (See the photos on page 10.) In my view, this is acceptable if you don't mind having a largish thing in your lap all the time. If you do, don't buy it for the cockpit.

The tradeoff is a fabulously sharp and colorful screen whose touch interface is close to flawless. Screen navigation is logical and easy to master in minutes. Like the iPhone, the iPad has a built-in accelerometer that senses position and automatically rotates the screen. This gimmick is fine when you want it, a nuisance when you don't, but there's a hardware lock out switch to keep the screen from freely spinning when you'd rather it didn't. It doesn't work with all apps anyway.

Screen glare is always an issue with cockpit displays and it certainly is with the iPad, too. Fortunately, the device is bright enough to power through this, so it's not much of a problem unless you're trying to photograph it. Direct sunlight readability is adequate, but sunlight illuminates every smudge on the screen and there are a lot of them. The screen starts to look like a pigsty after a day of use. (You get used to it…)

The 3G-equipped version of the iPad is GPS-enabled, but this is not the same class of GPS that Garmin offers. There's no external antenna and although the receiver seems adequate, it loses lock and is slow to update position. If Garmin, Control Vision and others weren't out there with better GPS receivers, the iPad's would be a killer. But they are. So it isn't. In any case, moving map apps—such as Wing X's—are rudimentary when compared to the capability of typical aviation portables. This may improve going forward. WingX's latest app, released at press time, looks promising.

If you're thinking the iPad would be great for displaying NEXRAD weather it is, but not in the cockpit. Yet. The hardware is Bluetooth capable, but there's presently no XM datalink receiver to fetch the datastream and I'm not sure there ever will be. The 3G-enabled iPad seems to engage AT&T's 3G cellular network at low altitudes, but it's neither reliable enough nor fast enough for count-on-it weather gathering. Further, its geo-referencing is somewhat limited. It geo-references on en route charts and sectionals, but not on approach plates or weather displays. That may change in the future, but not for now. Apple's specs say the iPad's operational altitude limit is 10,000 feet, but I tried it briefly above that altitude with no ill effects. It uses solid-state flash, so a floating drive head isn't a worry.

Want a yoke mount for the iPad? Good luck with that; the thing is huge. Screen glare, lower photo, is an annoyance, but tolerable.

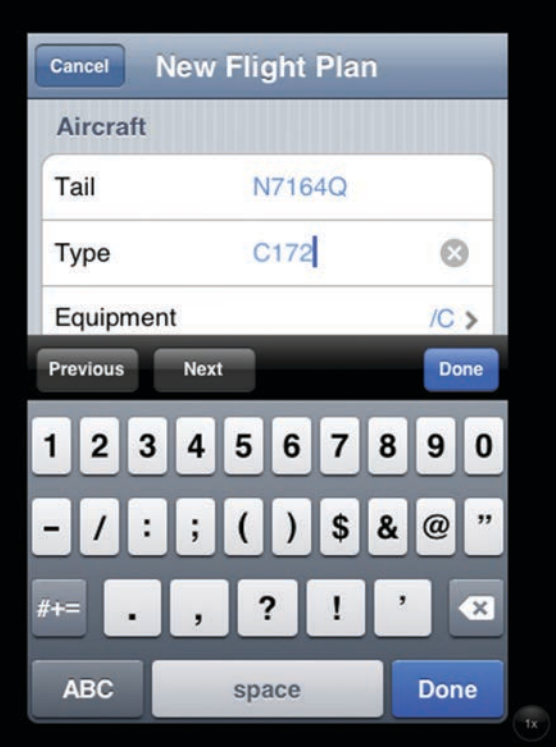
LOTS OF APPS

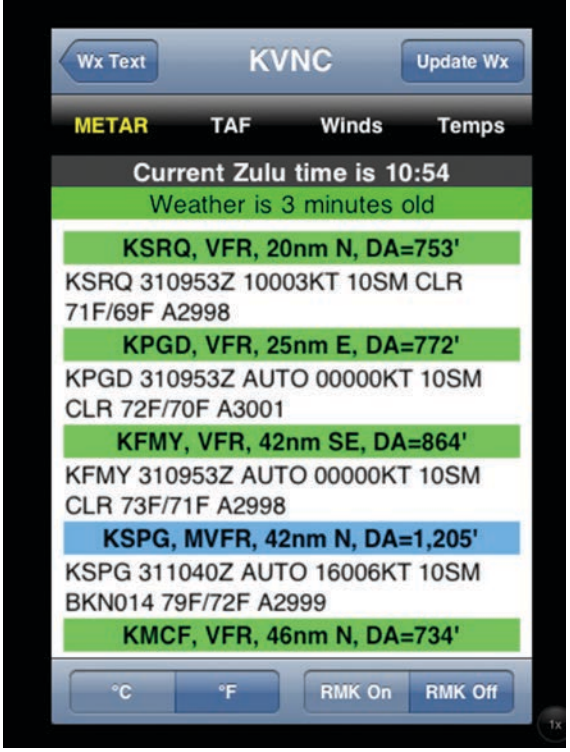
Apple's App Store is loaded with applications for aviation, but only a small fraction are what we would consider must-have. Strengths: plate reading, flight planning apps, POHs, E6B-type calculators and reference resources like FAR/AIM documents and textual weather. Okay but not so hot: weather imagery and moving map navigation.

Any app that will run on an iPhone will run on the iPad, but in reduced size. There's a zoom button to enlarge the display to suit the iPad. This

CHECKLIST

- **Overall, the iPad is cleverly designed, well made and easy to use.**
- **Display screen is sharp, readable and refreshes quickly. A great plate reader.**
- **Size is a problem. Yoke mount is out and panel mount proabably is, too. Kneeboard anyone?**
- **Worth having in the cockpit? Maybe, but thus far iPad hype outstrips its true value.**





iPhone/iPad apps abound; perhaps 20 of them are actually useful. Two of the top contenders are ForeFlight, left, and WingX, right. Both are good weather getters and flight plan filers and with 3G, you can do all that from almost anywhere.

knocks back the resolution a little, but it's not objectionable. As of early June, about a dozen apps had been optimized for the iPad and the list grows daily. Thankfully, if you bought the app for an iPhone, can you download it again for the iPad at no charge.

If you don't mind its inflated size, the iPad is an excellent plate reader--FAA's AeroNav charts only for the moment. There are several ways to get the plates, including ForeFlight and WingX's regional purchasing plans or free/donation-based services such as NACOmatic or pdfplates. Both of the latter will require a dedicated PDF reader, such as Goodreader.

The acid test for plate reading is downloading, retrieval and display. The apps do all of this reasonably well. ForeFlight and WingX, for instance, allow state or regional downloading of plates. ForeFlight's procedures for southern Florida, for example, required 33MB and took under a minute to retrieve. If you have a fast connection, you can load the entire U.S. procedures library. ForeFlight charges $74.99 a year or $24.99 per quarter.

To fetch a plate in ForeFlight, you tap an airport tab, type in the ID and get a list of all the procedures. Tap the one you want and the plate appears in full scale. You can pinch scale it or finger pan to suit. The plates are readable in sunlight (just) and at night, you can ramp the brightness to the minimum setting. It's still a little too bright, but it's tolerable. WingX's retrieval has a nice browser function that allows finger panning through a series of plates for a particular airport. Both of these apps are works in progress, but from what I've seen so far, the iPad is as good a plate reader as anything out there—better than a KindleDX and more readable than the SOLID FX8, not to mention being cheaper.

With ForeFlight, the iPad does both sectionals and IFR enroute charts. It scales these adequately—albeit slowly at times—and you can finger pan across the charts and even search them for fixes or airports. Could these replace paper charts? Given personal preferences, I'd say the answer for some users will be yes.

How to mount the bloody thing? RAM is about to release a dashboard/panel bracket, left, but it may not be a player for the cockpit. www.forpilotsonly.com has a nice metal combination kneeboard customized for the iPad. It sells for $149.95.

WEATHER, PLANNING

Through apps like ForeFlight or WingX, the iPad can fetch weather briefings with various degrees of ease and thoroughness, including route briefings. ForeFlight and WingX also allow flight plan filing, which you can do from anywhere where wireless or 3G is available and for that reason, I think buying the 3G version is worth the extra cost of the hardware and the AT&T data plan at $30 a month. If you travel often and don't want to be limited by lack of wireless access, it'll be worth it.

But…thus far, the iPad apps aren't that impressive at the granular briefings some pilots like, with multiple NEXRAD views and the data crunching capability of a full-blown flight planner like Voyager4. On the other hand, try running Voyager on a lap-

top perched on the wing while you're waiting for the fuel truck to show. So what the iPad gives up in capability, it returns in anywhere access and convenience.

Apps also excel at things like performance planning, weight and balance and E6B functions. For instance, Punkstar Studios has a series of POHs that do all of the principle calculations such as takeoff and climb performance, weight and balance and so on. For $9.99, these are a fair value. Other apps do more detailed CG calcs, power calculations, wind functions and so forth. If it can be calculated, there's probably an app for it.

BUY IT?

Does any of this make the iPad a clean sweep of the EFB market? Well, not quite. The aforementioned lack of cockpit weather and moving map capability stunt it, in my view. My guess is this capability won't improve enough to make the iPad an aera killer. On the other hand, it's a good plate reader and I doubt if anyone who buys it just for that purpose will be disappointed. It's still cheaper than the FX8 we reviewed in the June 2010 issue. And everyone will find useful favorites in the long list of apps.

The iPad's real strength is its general functions—the daily grind of Web browsing, dips in the e-mail river and specialty apps, not the least of which is Dogs Playing Poker. I haven't decided if I'll buy one yet and given that ambivalence, I think I'll wait for the inevitable price break, maybe around Christmas.

AC TV

For a video report on the iPad, log on to our sister publication, www.avweb.com, and click the video index on upper right of the homepage. Or use this direct link: http://snipurl.com/x6jcf

Gear of the Year: Aspen is Our Top Pick

Aspen said it would deliver affordable EFIS and it has, so it gets the top nod this year. Herewith are a dozen other products that excelled.

You can't imagine how difficult it is for us to keep a straight face when we ask a company for an estimated delivery date of some new airplane or widget. We dutifully report what these companies tell us and when they're out of earshot, we allow the sniggering and eye rolling to begin unabated.

The Aviation Consumer PRODUCT OF THE YEAR

But there are exceptions. Some companies do what they say they're going to more or less when they said they would. One of these is Aspen Avionics, which we are selecting as our company of the year. It's not that Aspen has never let a schedule slip, but that in its competently designed aftermarket EFIS systems, Aspen has done just what it said it would: delivered high-quality, flexible and reliable glass systems that many owners can afford.

Moreover, they have supported the installation of these products with good customer and technical support. We don't hear complaints about Aspen and believe us, we go looking.

So Aspen gets *Aviation Consumer's* 2010 nod for the top company and top product of the year. For more, see aspenavionics.com

BEST LSA: LEGEND CUB

Damn it to hell, we like these airplanes. The problem with many LSAs is that they feel…cheesy. In order to meet the weight restrictions, structure is reduced to the minimum and there's weight reduction at every turn.

Legend Cub

Next Dimension SR22 mod

PS Engineering PMA 8000B

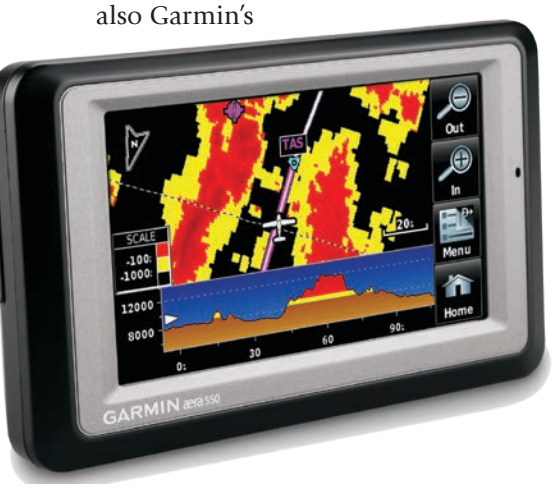
Voyager 4

But the Legend Cubs feel more like genuine Piper Cubs because, well, they sort of are. But they have improved construction methods, two engine choices and the build quality is simply second to none, in our estimation. When we go to shows, we always sign up to fly them for "editorial review." But really, it's just for the fun of it. See more in the April 2010 issue or at legend.aero.

BEST PORTABLE GPS GARMIN AERA

You're surprised? Like clockwork, Garmin seems to roll these things out at least once a year and we seem to beat the hell out of them and find that they work just fine. The aera line is unique because it is a line—four models are available—but it's also Garmin's first stab (a little inside GPS article humor there) at an aviation touchscreen.

What impressed us most about this product intro is that Garmin resisted the inevitable urge to trash the thing up with a lot of menus and capability that the processor and memory could probably support but that users don't need. It's kept to a simple, easy-to-use operating structure that anyone can learn. See the December 2009 issue or garmin.com for more.



MOD OF THE YEAR: NEXT DIMENSION SR22

There's a reason the Cirrus SR22 is a top seller. It's fast, fun to fly and nice looking. Cirrus got the airplane so right from the start that it hasn't seen a big mod market.

But the one mod that caught our eye is Next Dimension's major redo of the SR22. In case you haven't noticed, the market is flooded with recent model SR22s at good prices. ND's mod fits them with a Tornado Alley Turbo normalizer system plus Avidyne's Release 9, which we picked as our top EFIS last year. An upgraded interior and paint comes with the package.

Bottom line: A helluva airplane for well under the cost of a new one. We haven't flight tested one yet, but we're on the list. For more, see the January 2010 issue or ndaircraft.com.

BEST EFB: FLIGHTPREP CHARTBOOK

Electronic Flight Bags are a bit of a misnomer, since they don't actually displace a real flightbag. But they do carry plate readers, chart libraries, flight planners, utility programs and weather access, so they earn their keep. (No fuel strainer, sorry.)

Our top pick in our April 2010 review was Chartbook from flightprep.com. Ease of use, range of features and a bright display running on a solid CTL 2Go NL1 tablet PC made this product rise to the top. FlightPrep offers a range of related products.

TOP AUDIO PANEL: PS 8000

Even if you have a recent audio panel in your airplane, you probably need a new one. That's because you're carting around an MP3 player or a portable DVD and you need to play good quality stereo music. An old KMA24 won't do that.

But PS Engineering's slick PMA8000 series will do the job nicely and one version even includes a Sirius Satellite Radio receiver complete with remote control. In a market dominated by Garmin, PS Engineering continues to innovate and keep its competitive edge. So we're happy to tip the hat in their direction. For more, see ps-engineering.com or our review in the August 2009 issue.

LARGE COJONES AWARD: AUSTRO ENGINE

And it may be Austro's name on the door, but Diamond principle Christian Dries is the man responsible for pistol whipping a new diesel engine through certification in under 24 months. Diamond stubbed its toe badly with the Thielert (now Centurion) engines in the popular DA42 twin. But rather than retreat and regroup, Dries doubled down, finding $61 million to invest in a new diesel developmental project, plus the factory to build it. It's too soon to judge

Austro AE300

the engine—although we reviewed it in the July 2009 issue—but we think Dries deserves recognition for absolute Cargnegiean confidence and bravado. You just don't see that much anymore. Try diamondair.com for more.

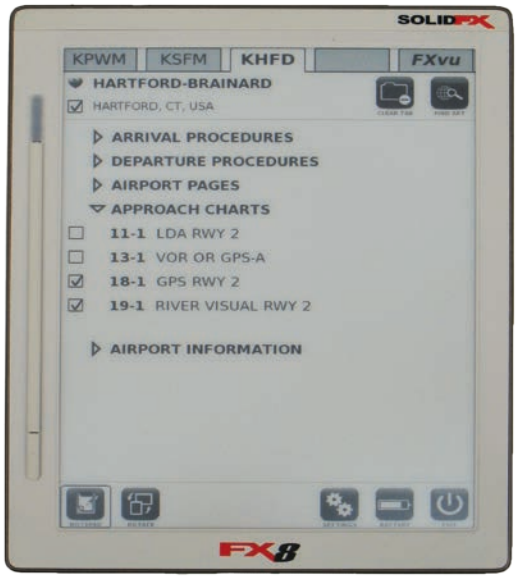
BELLY DEGREASER: ARROW, SIMPLE GREEN

We have seen ugly and it is the underside of a Cessna 182 that hasn't been washed in a year. There are dozens of cleaners to blast the grime loose and we tried most of them.

All of them work, but some work a little better and they would be Arrow-Magnolia's Fleet Wash and Simple Green's much touted Extreme Aircraft Cleaner. Both of these met our requirements for knocking the grease off without requiring crawling under the belly and scrubbing. Some things just aren't done, after all. Find out more in the May 2010 review and source from aircraftspruce.com.

BEST PLANNER: VOYAGER 4

We'll concede that it's a good thing that pilots actually tend to plan their flights rather than just kicking the tires and launching. And for that task, many pilots want a computer-based or online flight planning program. We tried them all—free ones and pay-per products—and we like Voyager 4 as the best does-it-all planning program. See seattleavionics.com for more and our January 2010 issue for the review.



SolidFX8

BEST VALUE IN 406 ELTS ACK E04

Unless you're in a hurry, in which case the KANNAD Compact is the second choice, the ACK E04 is a best value. It has been delayed to market, but its strong featureset and favorable price make it our top choice.

The reality is buyers are dragging their feet on 406 MHz purchases, so we have no compunctions about recommending a product that's just coming to market as we go to press.

The hidden side of 406 technology is that it can be expensive to install. The ACK E04 is a reasonable all arounder. See the June 2010 issue or ackavionics.com.

BEST JEPP READER SOLIDFX8

As noted in this issue's review of the Apple iPad, getting a plate reader right is no easy task. That's because paper approach plates and electronic displays just aren't meant for each other.

SolidFX's first try, the FX10, was a noble effort, but too big, in our estimation. The company's follow-on product, the FX8, gets it just right, albeit at a pricey $1195, plus the subscription costs.

But if you want a reader to do Jepp plates, this is the only game for now. As the iPad App Store rips into overdrive, we may see a Jepp app for that device. Until then, see solidfx.com.

TOP ENGINE SHOP ZEPHYR ENGINE

When an engine comes due, the first question is *where* to get it overhauled. There are dozens of choices, but our surveys have consistently put one shop at the top: Zephyr Engines in Zephyrhills, Florida. But Penn Yan Aero and Poplar Grove are right behind Zephyr. What makes a good shop? Three things, really. Customer service, customer service and customer service. These shops have grown loyal followings because they take care of people who do business with them. It's that simple. See our March 2010 issue for the full survey and more contact information.

BEST PAPER CHART CHOICE: AIR CHARTS

With EFBs and iPads, who the hell uses paper charts anymore? Not everybody, but most of us. But given how much we spend on data for boxes and navigators, there's a budget limit and one way to stay under it is to use Air Charts. This system repackages

ACK E04

the public domain FAA AeroNav services in a compact set of atlases. The approach plate booklets are updated via a periodic sheet rather than having to deal with all that paper every 28 days. It just makes more sense and it's cheaper. See our review in the May 2010 issue or airchart.com.

Air Chart Systems

LSAs for Training: It Works for the Wary

Our survey turned up accolades and horror stories. The takeaway was that a shrewd operator can turn a buck renting LSAs as flight training machines.

by Jeff Van West

Part of the grand promise of Light Sport aircraft and the Sport Pilot license was it would reinvigorate flight training, bringing busloads of new pilot starts attracted to cheaper flying with fewer requirements (like a medical certificate).

Soon after the dream of LSAs in the hands of students made some hard landings in reality we started seeing complaints that light sport designs were too lightly built for the rigors of flight training. Now that we're several years into the process and have some real numbers to work with, we've decided to give this a closer look.

DREAM, MEET REALITY

The short answer is that LSAs generally don't have the durability of something like a Cessna 152 and aren't cheaper to maintain—and that fact may have no net effect on the bottom line. This may explain why 90 percent of our survey respondents would recommend using LSAs as trainers, even though almost none reported their experiences as trouble-free.

> ***"It's a good solid training airplane. It just isn't going to last like a Cessna 152."***

Dennis Brampton of St. Charles Flying Service is in a good position to speak on LSA viability versus conventional aircraft. For the past five years, he's had both on the same flight line and going through the maintenance shop. He'll be the first to complain about poor durability and high repair costs, but then he'll admit his own numbers show it comes out as a wash.

His average maintenance cost (real cost, not reserve) for his 1978 Cessna 152 has been $24/hour averaged over the past five years. The average maintenance cost for each of two Evektor SportStars (with over 3300 hours of flight time combined) is $29/hour. He also operates a Remos GX but with only one year in service, the $17/hour maintenance cost is probably too low. The first year of SportStar operation was only $11/hour.

These numbers for LSAs were confirmed by other schools we spoke to. In fact, if one aircraft was cheaper to maintain, it was the conventional aircraft. For example, changing a tire on a Gobosh 700 takes three times as long as changing a tire on a Cessna 172. On the other hand, the required 100-hour inspections seem to run two or three hours less for an LSA. Rotax-powered LSAs running 100LL require twice the oil-change frequency of Mogas burners, and the oil change has some extra steps to cleanse lead. Numbers varied with how heavily the school used aircraft-grade parts versus hardware store equipment, which is legal in many, non-critical LSA applications.

There was also variation with just dumb luck. LSAs broke more often, but were often (but not always) slightly cheaper to repair. Major parts from manufacturers were often just as pricey as certified parts for Part 23 aircraft. But global takeaway is that,

CHECKLIST

- ⊕ There is a market for LSA rentals and sport pilot flight training.
- ⊖ Maintenance costs are equal to, or higher than, traditional trainers.
- ⊖ Real longevity of many light sport designs and their manufacturers are still an unknown.

over time, keeping a new two-seat LSA flying in a high-abuse environs was roughly equal to maintaining a high-time classic trainer.

Running this out to the bottom line is not straightforward. Fuel burns for the LSAs are lower, averaging 4 GPH for Rotax-powered equipment in flight training versus 5+ GPH for an average O-200. Rental rates are comparable. We saw a range of $85-$130/hour for an airplane S-LSA (as opposed to J-3s or air trikes) rentals, with a tight average of $100. But dispatch reliability of the LSAs is reported as either equal—which doesn't bode well when you're comparing an essentially new aircraft to a 20-year-old one—or worse, mostly because of parts availability (or lack thereof) that can keep an aircraft grounded for weeks. This can ruin customer confidence if the only plane they can fly is repeatedly down.

Brampton shared a story that shows an interesting twist on this. Needing a gear leg for the Evektor, he contacted the company but they couldn't help him right away. They put him in touch directly with the Czech Republic supplier, and the gear leg arrived in five days. That's pretty good time-wise, but having customers call overseas for parts is not a viable long-term support plan. These stories are not rare. One Sport-Cruiser operator we know ordered a gear leg that arrived as a piece of unfinished fiberglass without any bolt holes drilled or even marked.

Overall, comments from flight schools fell on a skewed curve. Some folks were just thrilled with their LSAs as trainers: "With lights and a Garmin 430W, we can teach Sport, Private and Instrument students. As soon as the FAA's complex rule is signed, we can also teach Commercial and CFIs in it—at 4 GPH!" A few had tried and walked away: "We tried very hard to make it work, but I lost a lot of money and time." Most schools were staying in the game, but well past any Pollyanna illusions that S-LSAs were ideal trainers.

BRAND BY BRAND

We asked flight school and lease-back LSA owners how their specific make, model and year of LSA faired in several specific areas. While the total sample size we were able to

Light wing loading combined with light structure makes the aircraft less resilient to poor technique. This has already had fallout for insurance rates for LSA flight training.

gather wasn't large enough that we can make statements with strong confidence (with too few responses and one person's unusually good or bad luck with a model will skew the results), we did see trends emerge.

A surprise favorite was the Allegro 2000 and 2007. Just three schools reported on them, but that represented a total of six aircraft. One CFI told us the 2000 was the "Best trainer I have ever been able to teach in. I have 10,000+ total time, 6000 dual and 1500 in the Allegro. This plane has over 2000 hours in a training environment and it is showing no signs of slowing down. … I don't care if I ever go back to the bigger stuff." Users spoke of good manufacturer support—critical in school satisfaction with any of these aircraft.

No surprise was that Tecnam aircraft faired quite well, with about a fifth of the schools using at least one Tecnam. On the plus side was general solidity and ease of repair of the metal airframe and parts availability. Weak points were the interiors, particularly wear on the seat and seat belts. The nose gear is a weak point on earlier models. "Tecnams are sufficiently robust for flight training [but] subject to finesse in ground and flight handling. They are not Cessnas. No turning and braking at the same time on the ground." The Echo Super seemed to be the weakest, with more electrical, door/interior and gear problem than the other models.

Across the board, we saw an improvement in durability with revised or newer designs from the same company, so an early-model LSA might not be the bargain it appears. The fact that newer designs exist also inspire some confidence the company has been around long enough to work out its parts support.

The most popular LSA for flight training was the Evektor SportStar, edging out Tecnams by a point. They were rated universally good in systems, such as flight controls or flaps. They were OK, but not without issues in canopy, tires and landing gear. They were weakest in warranty support, parts availability and manufacturer responsiveness.

Remos aircraft got more middle-of-the-road comments, some loving it and others not so happy. The fuel system was a complaint, but this may be because the Remos doesn't carry as much as other LSAs. The gear (both nose and main) were reported as a weak point. The main gear carryover has recently been replaced

with a more robust (but heavier) design. The same has happened with the nose gear. We also saw mixed reports on the ease and cost of Remos repairs and warranty support. "It was not handled well," one respondent told us.

Other brands were at such low sample size, trends have to be taken with some skepticism, but the Gobosh and SportCruiser held up about as well as the best LSAs with complaints about parts availability and the overall cost of repairs. Jabirus were singled out as good for large pilots—six feet tall and 330 pounds—but doors and paint were a problem. Flight Design's CT line had complaints about gear issues and parts availability, but the complaints were almost entirely about the older CTSW design rather than the newer CTLS.

Worth noting is that super-simple designs, such as the Cub Crafter's Top Cub or vintage J-3s, did much better than any of the newer LSAs.

NEW-SCHOOL ECONOMICS

A completely unexpected fact that surfaced during this study was how many pilot starts walked in the door specifically looking for Sport Pilot licenses. One school reported a shocking nine out of 10 pilots fit this category. We contacted several schools and saw a range from a third of new students specifically seeking Light Sport to 80 or 90 percent of all new applicants. These are just from schools offering both LSA and traditional trainers.

One school told us, "Other than training in the Jabiru, we are nothing special as far as schools go but I have students that drive as much as seven hours one way and stay in a hotel or camp in their motor home to train with us because there is nobody closer [who operates LSAs]."

The promoting of Light Sport training seems to be generating some real traction, so there is a market for these aircraft on the flight line. As we said earlier, how a school chooses to operate the LSAs—parts used in maintenance or 100LL versus autogas—will have a noticeable impact on the bottom line. But it seems clear that what LSA offers is newer, more technologically flashy aircraft, but not cheaper ones, Or easier to fly, for that matter. Renters may be turned off by lower wind limits some schools impose on their LSA fleet.

While it might not jump to mind as a durability issue, damage due to less-agile, older pilots—a significant market for LSAs—getting in and out came up. Stepping on no-step areas or leaning on lightweight doors and canopies were an issue. High-wings fared better than low.

From where we sit, the critical factor in how this party will go is manufacturer support. Built lighter by design than the trainers of yore, these aircraft will break more often, in both significant and mundane ways, than a 152 ever did. So long as the aircraft-on-ground time can be kept to a minimum and parts costs are kept in check, the short-term viability is there.

The lurking issue is longer-term and it's harder to predict. If today's $125,000 Light Sport is still on the flight line 20 years and 6000 flight hours from now, that investment should pay off. But if by that point the aircraft is so worn out it must be retired, that represents an amortized $40/hour in investment and cost of money. That may be more than our industry can afford. And it's unclear if any LSA will even do that well.

It won't be too long before some LSAs have the opportunity to turn that many hours ... or die trying. Then we'll see how well the LSA promise holds up in the cold reality of flight training.

Cirrus SR22T: A Follow-On Turbo

The new turbocharged model is claimed to be smoother and quieter than previous offerings, but does it give up speed to the TN model?

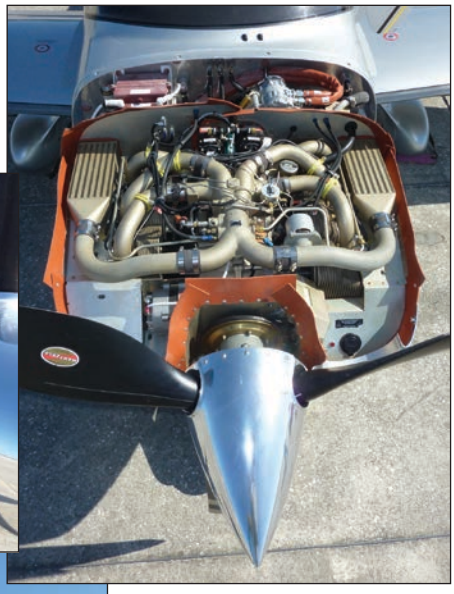
by Paul Bertorelli

When Cirrus went its own way and offered the Tornado Alley Turbo as an STC in the SR22, the market practically planted a wet kiss on the project. Now, with a new model called the SR22T, Cirrus is following up with a groundboosted rather than a turbonormalized system.

This time, it did the engineering in-house rather than relying on Tornado Alley, although it's clear that Cirrus took a page from the TAT book in terms of overall design, especially intercooling and leaning strategy.

And how about performance? From a brief test flight in May, we conclude that the SR22T approaches par with the TN model but appears to be bit slower. We'll give our data below, but without doing a side-by-side flyoff, we can't make a definitive judgment on performance.

Although designed to run lean of peak, it burns a little more fuel, which we would expect, given the low-compression pistons. Otherwise the airplanes are so similar that we have to ask: Why do this?



Cirrus's follow-on project to the SR22 TN has a 315-HP TSIO-550-K. As with the TN model, the engine has generous intercooling (upper right) and different inlets and cowl louvers. It uses the same Hartzell composite three-blade prop, but the governor is fixed at 2500 RPM, eliminating the cam- and-cable arrangement.

MARKET TALK

In its marketing summary, Cirrus listed changes in the airplane and their benefits. These include full-time 2500 RPM operation for smoother running and power changes, a dynamic leaning bug on the Garmin Perspective system, a 15-pound lower empty weight and a new oleo strut on the nosegear.

The claim that may catch the attention of many buyers is this: "This lower compression ratio engine is more tolerant of lower octane fuels and reduces the risk for customers with the future of…fuel in question." We take this to mean that Cirrus sees the SR22T as being capable of operating on less than 100-octane fuel.

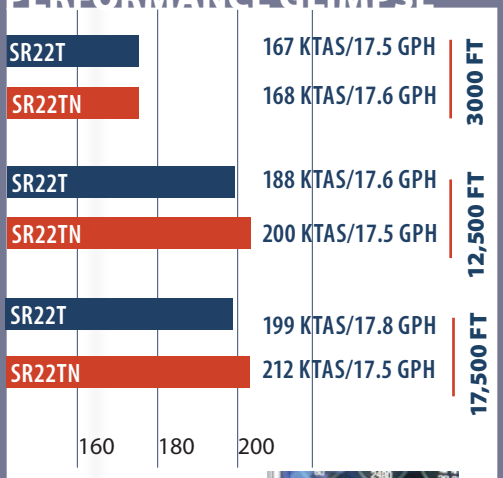
We're not sure if that will be a hard sales point, but if it is, customers will need to ask Cirrus to clarify the claim. Some may also be thinking twice about buying the normally aspirated SR22, whose IO-550-N sports the same 8.5 to 1 pistons as the TN. Here's what Cirrus's Todd Simmons said when we asked about this:

"We have implemented TCM's suggested path and will be working very closely with them to ensure a seamless transition for our customers to whatever fuel the industry selects. We are confident based on information TCM has shared with us that we have more than bounded the problem for our flagship product here, and also have a viable technical path for the same issue as it relates to the normally aspirated SR20 and SR22." Pricewise, the new SR22T will be across the board with the TN version, assuming equivalent equipment. That means invoices typically a little north of $600,000, variable with options.

CHANGES

While the TN model turbonormalizes the IO-550-N, the SR22T models uses

PERFORMANCE GLIMPSE



FLIGHT TRIAL NOTES

Data for this chart were collected from flight observations. SR22 TN was flown in about ISA +5, the SR22T in ISA +1 5. All values were observed on onboard instrumentation except the SR22TN at 3000 feet, which is a POH estimate. Cirrus concedes a slight speed difference but believes this comparison isn't represenative.

a groundboosted TSIO-550-K with a pair of turbochargers controlled by a single wastegate. Maximum normal boost is given as 36.5 inches MAP for 315 HP at 2550 RPM. (The TN has 310 HP at 2700 RPM, so on power, the two are essentially a wash.)

We uncowled the engine and had a look topside and a peek below the deck. Cirrus clearly followed the TAT lead in using large-volume intercooling; the coolers are larger than those used in the STC project turbo that Continental was showing at Oshkosh last year. Cirrus took pains to point out that the SR22T is in no way related to the Continental project, which used a different variant of the TSIO-550.

CHECKLIST

- **Overall performance is strong. Lean-of-peak strategy is a plus.**
- **Although we prefer a separate prop control, elimination of cam-and-cable control suits us.**
- **Although billed as lighter, the airplane appears a few knots slower than the TN .**
- **CHTs are within acceptable ranges, but hotter than the TN. Limits of 420 degrees F strike us as ill advised.**

Other changes include new induction plumbing consisting of a pair of pipes running through filters on the forward cowl. For alternate induction air, the system has an automatic magnetic suck-open door. There's also some increased clearance for exhaust cooling and two new louvers on the bottom of the cowl. For this model, Cirrus did away with the cam-and-cable prop control and hardwired the prop at 2500 RPM which, says the company, accounts for the smoothness and quieter cabin. We couldn't say it was noticeable in the cabin, but Cirrus says environmental noise is reduced to 80.8 dB from 83.6 dB.

Other minor changes include the addition of an oleo strut on the nosegear up inside the lower cowling meant to absorb shock on the nosegear. The avionics package—the Garmin Perspective—remains top of the line for this market and to assist in leaning, the system now has an electronically displayed leaning bug on the fuel flow indicator. The system calculates the correct lean-of-peak flow—the POH lists no full rich settings—and you merely drag the flow back and match the needle to the bug.

Weight wise, Cirrus says the SR22T is 15 pounds lighter than the TN. The example we flew had a useful load of 995 pounds, leaving 443 pounds with full fuel. That's two people and a bunch of bags or four people and 50 gallons or so. As far as overhaul costs go, the TSIO-550-K is more expensive to overhaul than the IO-550-N, even if the TAT turbos are included. Although the K-model isn't yet listed, the TSIO-550-C used in the Columbia/Corvallis is a good benchmark. It carries an installed overhaul price of $60,000, according to the *Bluebook Price Digest*. The price for the IO-550-N is $33,000, plus the cost of the turbos, bringing the total to under $50,000.

FLYING IT

We tried the airplane briefly from our homebase in Florida on a warmish, ISA +15 day. Obviously, apart from

AC TV

For a video report on the SR22T, log on to our sister publication, www.avweb.com, and click the video index on upper right of the homepage. Scroll down to the Cirrus SR22T flight trial video.

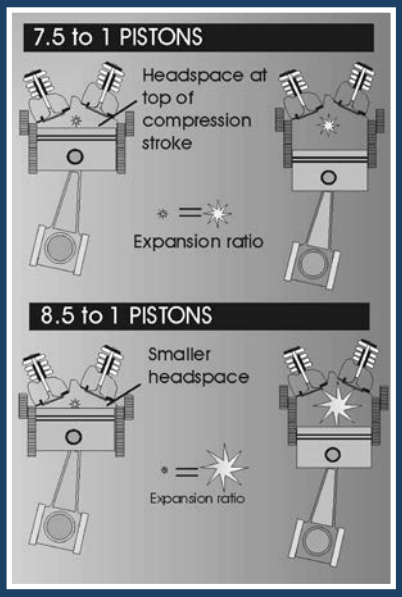
HIGH COMPRESSION vs HIGH BOOST

Coaxing power out of an engine is a matter of balancing a handful of variables, but getting *more* power out of one inevitably leads to the perennial argument of boost versus compression ratio. This frames the Tornado Alley vs. Continental argument in crystal clarity. Sport tuners—the guys running around in pumped up Toyotas with six-inch exhaust pipes—have the same endless arguments and they sometimes settle them by digging a crankshaft out the pavement.

Higher compression ratios yield more power and slightly more efficiency because of larger gas expansion ratios. The fuel charge does more effective work because it burns more completely—but also faster. The back side of the high-compression knife cuts in the form of potentially higher cylinder pressures and temperatures that encourage detonation, thus higher octane fuel is a must.

Lower compression ratios lower the octane requirement at the expense of lost power and efficiency. Compressing the fuel/air charge with a turbocharger or supercharger gets some of that back, but the overall *effective* compression ratio—the combination of static compression ratio and the boost—has to remain lower to maintain the detonation margin. Furthermore, if the incoming compressed fuel/air charge is hot, which it will tend to be given the laws of physics, the detonation advantage of lower compression ratio may be lost. That's where intercooling and good cylinder baffling come in.

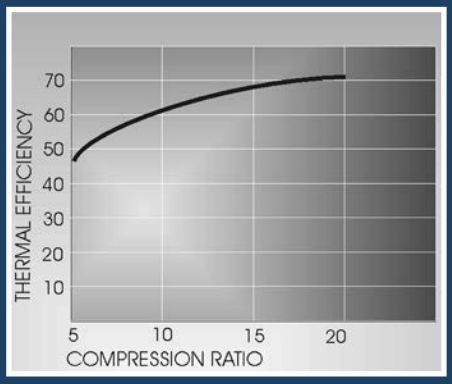
Low compression ratios in turbocharged engines used to be accepted wisdom that no one questioned, for both aircraft and cars. The turbonormalizing idea—which retains high-compression pistons—has fought a rearguard effort against this monolithic wisdom subscribed to by both major engine manufacturers. Tornado Alley's Cirrus setup is the most spectacular success for the turbonormalizing philosophy and philosophy is exactly the right word, in our view. The differences in performance may be slight; neither is a slam dunk and both hinge more on how well the installation is engineered and less on underlying physics. In the automotive



world, designers are pushed relentlessly to improve economy without reducing performance—two contradictory goals. As a result, there's a well-established trend toward using small displacement engines with turbochargers. And the car guys aren't wimping out on the compression ratios, either.

Take the 1.8 litre Volkswagen Passat. It squeezes 158 HP out of 110 cubic inches using turbocharging and a compression ratio of 9.8 to 1, far higher than anything in aviation. That high CR—along with other factors—yields a combined fuel economy of 30 MPG compared to 23 MPG for a larger displacement version without the turbo and 11.3 to 1 pistons.

Yeah, we know…cars aren't airplanes. They have a different duty cycle, water cooling, ECUs, dual overhead cams and the benefit of volume driving R&D. Still, they do show that it's possible to make measureable gains by challenging the accepted wisdom, if not running around it entirely.



fuel flow and cruise speeds, the largest concern with a turbocharged engine is heat rejection. The turbonormalized version from TAT enjoys a slight efficiency and heat rejection edge and its well-designed intercooling and baffling makes the most of that. It's one of the coolest running turbo setup we've seen.

After some brief maneuvering, we did some step climbs to altitude to test performance. Down low, at 3000 feet, we noted a true airspeed of 167 knots on 17.5 GPH. That's 80 percent power, by the way, and on the lean side of peak, which is all the power table provides. Neither the TN nor the turbocharged version have much advantage over the normally aspirated SR22s at low altitudes because all three make the same horsepower. As the climb progresses, however, the boosted engines do their stuff.

Unfortunately, one of the TIT sensors was faulty, so we could record only one temperature source. At 3000 feet, we saw 1640 degrees on the TIT with the hottest CHT at 366 degrees. Both are well below the POH stated limits.

Climbing to 12,000 feet and in level flight, we recorded 1620 degrees TIT with the hottest CHT at 378 degrees. Once the airplane settled out, it was truing 188 knots on 17.6 GPH, which is about 5 knots better than the POH claims, according to our checks.

Since many owners of turbocharged airplanes fly in the high teens, we headed there next, performing a slow airspeed, high-angle climb on the way up. As expected, this pumped up the CHTs, but they remained below 400 degrees. At 17,500 feet, true airspeed settled at 199 knots on 17.8 GPH, again a little higher than book on airspeed but .2 lower on predicted fuel flow. The highest CHT was 386 degrees—not too alarming, but we would rather see it lower. We allowed 10 minutes for it to stabilize.

The chart on the previous page shows our noted data from our SR22T flight and also some TN numbers. For

CONTACTS

Cirrus Aircraft
866-290-0418
www.cirrusaircraft.com

comparison purposes, we hauled out our test data from a SR22 TN flight conducted in 2008 with a Cirrus demo pilot at similar altitudes but on a cooler day. At 17,500 on that flight, with an OAT of -16 degrees C, still a little warmer than standard, the highest CHT was 348 degrees while the highest TIT was 1645. We recorded a true airspeed of 212 knots on 17.5 GPH. To be fair, we've seen CHTs as high as 380 in the TAT system. But that's the limit temp.

And this is where things get interesting and also confusing. We took our numbers to Cirrus which said its own engineering test data revealed similar speed envelopes for the two airplanes and it believes our airspeeds for the SR22 TN aren't represenative, but Cirrus concedes the TN might have a slight speed edge. To sort this out, we checked with TN owners who reported typical cruise speeds in the 201 to 205 knot range.

Of larger concern to us is cooling. According to the POH, Continental and Cirrus are allowing normal cruise CHTs as high as 420 degrees which we simply don't agree with. Continental has had long-standing issues with premature cylinder wear and those kinds of temperatures can't be helpful. We would prefer to remain at least below 380 degrees and our flight was just too short to see if that is doable. Cirrus insists that cooling isn't an issue with the SR22T.

CONCLUSION

The SR22T is clearly a strong performer, but we have concerns about it. First, in the SR22 TN, Cirrus marketed what was accepted as one of the best turbocharged systems ever developed and with more than 800 out there, it has a wildly loyal customer base.

Our surveys indicate that owners of these airplanes fly them a lot and are enthusiastic about their performance, reliability, economy and service history.

In this context, the SR22T may be a harder sell for Cirrus. By dint of higher overhaul costs and fuel burn, its operational costs are a bit higher and our brief flight trial suggests it's not quite as fast as the TN version. Again, we would like to see a wing-to-wing flyoff before committing to that. The speed difference may be real or it may get buried in the inevitable variation between airframes. We think a perspective buyer would be advised to fly both models, since Cirrus says both will remain in the active lineup, at least for now.

The CHTs we saw, while acceptable, aren't quite as cool as the TN's. Until we see more operational history, we simply can't judge the heat issue on one flight. As noted, we just don't agree with running routinely at CHTs above 400 degrees in *anything*, given the potential for cylinder failures.

We like the addition of the leaning bug and we thought the throttle action was smoother without the cam-and-cable gadget. The fixed RPM introduces some worries about ring flutter on fast descents, but we could live with that until service history shows it to be a problem (or not).

Further, Cirrus built an exceptionally good service history with the TN but is now setting the clock back to zero with a new installation. It may work out just fine, but we'll await customer experience before judging it.

All things being equal—and they pretty much are here—we would tilt toward the TN version for now. We'll take another look after Cirrus has had these airplane in the field for awhile.

We found Vertex units, like this VXA-300 performed well, but have a complex operating logic that hampers their utility.

Portable VHF radios: Sporty's SP-400 Shines

Call 'em suspenders with over-equipped glass panels or a belt in a stark LSA, but we think portable transceivers still have a place in today's cockpit.

by Larry Anglisano

Despite the ridiculous backup common to modern cockpits, the portable radio is the last resort when all other options fail. But not all are created equal, and add-ons, such as an external antenna connection, can play seriously into performance and cost. Here's our hard-nosed report.

Our criteria: Portables must have a high-end transmitter with a modulator that can reach reasonable distances at altitude. They must offer a headset interface. They must be small enough to stow in a map pocket but large enough for easy use in high-workload emergencies.

CHECKLIST

- ⊕ Great performance at reasonable cost.
- ⊕ Handy for ATIS and clearances as well as emergencies.
- ⊖ External antenna virtually required for good range.

GETTIN' THE GEEK OUT

Nearly all portable airborne radios offer roughly one watt of transmit power (which is still way more than your average cell phone). Contrast this to a panel-mount radio that transmits 10-15 watts of power and you see why an external antenna is almost a required accessory for serious use of a portable.

Quality of the built-in microphone also matters. In our view, headsets are required when using any portable com in the cabin of a piston aircraft. But there could be a time when your only headset fails and your portable is your only option.

We saddled each transceiver to a calibrated spectrum analyzer and measured both transmit power output and receiver sensitivity. We also tested the nav receivers in the units that were so equipped with a calibrated nav-signal generator, injecting a signal direct into the unit's receiver and radiating a signal to the unit's rubber antenna.

We used them in flight (and dropped two on a Piper flap handle), stuffed them into our unorganized flight bag and strutted around the airfield with them in our cargo pants. We even tested them in our kitchen over morning coffee where, despite roughly 12 miles of hilly terrain between us and the airfield, all but the Vertex units could pull in the ATIS at half-open squelch.

SPORTY'S OLD AND NEW

The SP-200 has always represented a good value, in our view. It's a no-nonsense unit that we applaud for its simple, yet rugged, design. We think Sporty's offers the most robust units of the ones we tested. It's also the largest in the group, measuring 6.65 inches tall, 2.35 inches wide and 1.46 inches deep. It weighs 16.64 ounces with battery pack. This isn't a problem unless you want to stuff the thing in your pocket.

The real issue we had with it—and others we tested—is the number of AA batteries it requires: eight in all. There is a NiCad option but Sporty's recommends using alkaline because their storage life is more predictable when used for backup emergency use. To its credit, the duty cycle when running on alkaline is quite good. If you limit your transmissions and display lighting, its stamina is over 15 hours. In our three weeks of testing, we never had to change batteries.

The controls and lockable keypad are hearty and easy to use. Simple

PORTABLE RADIOS	STREET PRICE	SIZE	RECEIVER	STANDARD ACCESSORIES
ICOM IC-A24	$299	5.7 X 2.1 X 1.6	COM / VOR / NOAA WX	HEADSET ADAPTER, CASE,BELT CLIP, RECHARGEABLE BATTERY PACK
ICOM IC-A6	$249	5.7 X 2.1 X 1.6	COM / NOAA WX	HEADSET ADAPTER, CASE,BELT CLIP, RECHARGEABLE BATTERY PACK
ICOM IC-A14	$199	4.5 X 2.0 X 1.5	COM / VOR / NOAA WX	RECHARGEABLE BATTERY PACK, BELT CLIP, HAND STRAP
SPORTY'S SP-200	$299 DIRECT	7.2 X 2.3 X 1.5	COM / VOR / LOC	AA BATTERY PACK, WRIST STRAP
SPORTY'S SP-400	$399 DIRECT	5.5 X 2.5 X 1.4	COM / VOR / LOC / GS	AA BATTERY PACK, WRIST STRAP
VERTEX VXA710	$299	4.5 X 2.5 X 1.2	COM / VOR / NOAA WX / BRS / FM	LITHIUM-ION BATTERY, BNC ANTENNA ADAPTER
VERTEX VXA300	$219	5.5 X 2.5 X 1.4	COM / VOR / NOAA WX	NIMH BATTERY, BNC ANTENNA ADAPTER, HEADSET ADAPTER, BELT CLIP
VERTEX VXA220	$179	4.0 X 2.4 X 1.2	COM / NOAA WX	NIMH BATTERY, BNC ANTENNA ADAPTER, HEADSET ADAPTER

volume and squelch knobs and a last frequency recall button are nicely spaced apart on the top of the case while the transmit and display and key light button are on the side. You can easily pick this unit up and use all of its features without touching the manual. We especially liked the Clear key that erases a digit if you botch a frequency entry, and frequency memory storage.

The nav side includes a VOR and Localizer receiver that allows for OBS selection and includes electronic CDI at the top of the LCD display. We found the nav receiver to be excellent, with solid reception in the aircraft and on the test bench using the BNC-connected rubber antenna.

We wished the unit came with a headset adapter as standard, but at $199 it's tough to complain. Popular options include the NiCad battery, external power plug, carry case and spare AA battery cases.

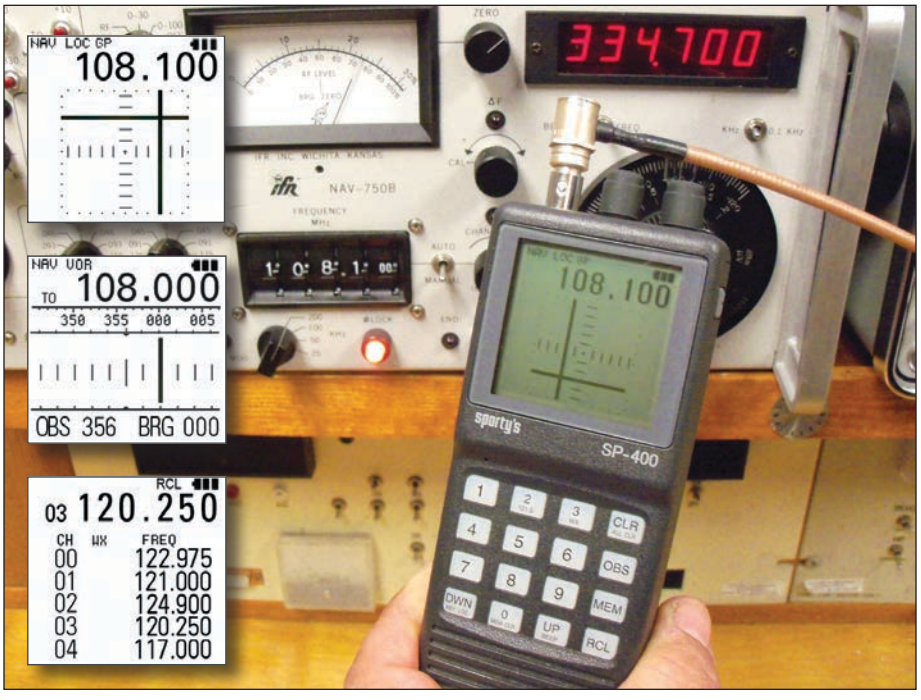
Sporty's offered us the first look at the new $399 SP-400. Unique to this unit is a glideslope receiver, which could save your hide if you had to slide down an ILS with a dark panel. The SP-400 performed exceptionally well, with the localizer receiving down to 115 dB and Glideslope down to 95 dB going direct into the receiver. Our technician marveled, admitting it was better than some panel-mounted gear. He was equally impressed with the unit's com performance, noting crisp modulation and decent receiver sensitivity. The unit has good transmit sidetone (the sound of your voice you hear when you transmit) with headsets.

The SP-400 is comfortable in hand and the LCD display is sharp, but we weren't impressed with its side viewing angle. This is common with monochrome LCD screens. Display backlighting helps.

Like the lesser SP-200, this unit uses AA alkaline batteries that offered plenty of juice during our testing. If this unit was to be used as a primary (and for some applications we think it's worthy) we suggest connecting an external 12 volts. There's a headset adapter standard, but it impressed us with clean modulation from the internal microphone and a reasonably-loud speaker.

ICOM

The popular A24 is the flagship model from ICOM and features com and nav functionality (the A16 is an



Sporty's SP-400 hits the target of rugged construction and simplicity without sacrificing any essential functions. It's also the only unit with a glideslope receiver.

Sporty's SP-200 (center) is a bit big. ICOMs (right-hand two) are a good balance of small case and sizable buttons. Sporty's new SP-400 is about the size of the Vertex VXA-300 (second from left).

identical unit less navigational functions). ICOM brags of the unit's single-handed operation for use while flying and it fits the task, in our view. With battery pack it measures 5 3/32 inches tall by 2 1/8 inches wide by one inch thick, and weighs roughly 15 ounces. This proved to be a near perfect stature for a portable. When we first started using the unit we found some of the controls to be out of place. For instance, the Squelch is adjusted by pressing a dedicated Squelch key and then setting threshold with the right rotary knob. We wished for a dedicated, one-shot squelch adjustment.

Throughout our testing we grabbed the more prominent rotary knob at the top of the case to adjust the volume. Wrong control. This knob changes the frequency (a feature we like rather than keying it in from the keypad.) But even so, this knob we found annoyingly close to the flexible antenna.

The nav feature is easy to use and offers both To/From navigation and the current radial. It also shows a CDI. It wasn't as good a performer as the Sporty's in nav mode and seemed susceptible to RF interference. We like the NOAA weather radio alert function when plugged into a wall outlet (the weather function can also be used when on the air-band). There's a 200-channel memory bank for frequency storage, which might be overkill. All the ICOM units have a good display with easy-to-read characters in all lighting conditions. The unit has a 1650 mAh NiH battery with excellent endurance. A double-A pack is available.

ICOM's A14 is a communications-only portable with a special 700mW loudspeaker using a BTL amplifier (essentially dual amplifiers that drive both ends of a speaker load). For the electronically challenged, this makes the A14 output loud. So loud, in fact, that we used the A14 while taxiing a Grumman Tiger with its canopy slid open and could easily communicate with ground control during a maintenance run-up.

The copy we tested had the optional six-battery AA alkaline pack that gave the unit a large footprint. Standard is the Li-Ion pack advertised at 18 hours of use. We like the

GOT RANGE? TRY IT WITH AN EXTERNAL ANTENNA

A watt of power broadcasting from a portable rubber antenna inside a cabin isn't going to offer much performance. Any chance of transmitting and receiving as far as a panel-mounted com requires an external antenna.

The only real expense in installing a dedicated antenna for the portable is opening the interior to mount it and run coaxial cabling to a convenient spot in the cockpit. A simple metal-element antenna is around $100. Fiberglass whips are closer to $200. Some such installations include a panel-mounted antenna jack while others simply have antenna cable coiled up in a map pocket ready for quick connection. You'd need an expensive splitter for a portable and a panel mount to share an antenna and it just isn't worth it for rare emergency use.

A beneficial time to install an auxiliary com antenna system is when the aircraft is already opened up for other work. If your shop is installing new primary com antennas there's usually no reason not to utilize one of the older antennas for emergency use. If you are pulling out a now-useless Loran-C system, this leaves an open antenna location for installing an aux com antenna. Your shop can even use the existing coaxial cable.

simplicity of the A14 as well as its rugged case and easy to use buttons. We don't care for the squelch keys that are built into the side of the case, below the transmit key, that bring up a squelch value on the display. We prefer a dedicated knob.

VERTEX STANDARD

We own an older Yaesu portable amateur radio and can say that these Vertex aviation units don't come close to the Yaesu we have grown to like. We're impressed by the small size, as well as some smart features, but remain unimpressed with the feel and occasional quirkiness of the controls. We don't like the SMA antenna connections as it requires using an included adaptor if connected to most external antenna setups. It also took us a bit to figure out the screw-in style microphone and headphone jack at the top of the case.

The smart features include a keypad beep when punching in frequencies (which the Sporty's doesn't have) and the bright, dot-matrix displays. We also like the battery-saver function which sends the unit's receiver into hibernation mode when quiet.

One day we had the VXA300 and ICOM A24 side by side on our desk for testing and found the Vertex would sometimes clip the first part of a reception, receiving a second or so after the ICOM. We assume this was from the receiver coming out of hibernation. The transmitter was good: over a watt of carrier on the scope and a high-quality modulator.

The VXA-300 Pilot III is a com and nav (the VXA-220 is com only but with a loudspeaker). Controls are not as intuitive as the Sporty's or ICOM models. For instance, the on/off rotary knob serves triple-duty as power, volume and menu access. You press the knob for accessing unit menus. It's not bad, just different and we envision some owners stumbling.

The VXA-300 performed well in the real world and the unit's stature proved perfect for ease of carrying and single-handed use. The nav receiver was spot on with the on-board GNS430W. Interesting is variable audio tone (audio pitch, really) control that can be set for a specific condition. We think panel-mounted radios can benefit from this feature. There's also a voice-actuated function for hands-off use. For instance, when a headset is plugged in the unit will automatically begin transmitting, similar to a VOX intercom.

The VXA-710 is a submersible, tiny com and nav unit measuring 4.5 inches by 2.5 inches by 1.2 inches that's the absolute smallest of the group. While it may be easy to carry, its buttons were just too small for our fingers. The zero key was placed in an awkward location in the keypad. But this wasn't nearly as awkward as the feature-set.

For days we couldn't find a squelch adjustment on the 710. We finally reached for the manual and learned it was buried in a menu. In fact, a couple of times we turned the unit off and then back on because we got so lost in button-pushing. We think it's too complex for an airband backup or primary.

Keypads and LCD screens are illuminated in Vertex Standard's renowned Omni-Glow amber hue, for increased visibility and minimal impact on your night vision. Omni-Glow can be configured for both brightness and contrast. We can't come close to covering all of the features that these Vertex models offer, which gives you an idea of how complex they are.

CONCLUSION

Gulf Coast Avionics in Lakeland, Florida, graciously provided us with many of the test samples for this article. We mention this because both ICOM and Vertex ignored our requests for units to review, while Sporty's, on the other hand, went above and beyond.

Perhaps each company was showing clairvoyance as our top pick is the Sporty's SP-400. Its performance is clearly exceptional and worthy for sole means navigation, including an emergency ILS. At $395 before discounting it's a solid bargain.

After using the SP-200 and 400, we found ourselves annoyed by the busy feature set of the competitors. Simple is better in an aviation portable.

For a well-rounded, reliable and feature-rich portable, we have no problem recommending the ICOM A24. but the extra dough for the nav function is questionable, in our view. We might instead opt for the IC-A6. The way we see it nearly everyone who flies IFR, or even VFR, has a portable GPS that would be superior to navigating by a VOR using a handheld. If you are a HAM we suspect you would be fond of the VXA710, to add to your collection of radio toys.

Lastly, if you're looking for decent in-flight performance from any portable, install an external antenna. That should ensure reliable communications when things go to hell—which is why we buy these things in the first place.

Part of the budget SP-200's bulk is the eight-cell battery pack. Alkalines do have a more reliable shelf life.

Larry Anglisano puts the screws to review avionics at Exxel Avionics in Hartford, Connecticut.

CONTACTS

ICOM
800-872-4266
www.icomamerica.com

Sporty's Pilot Shop
800-776-7897
www.sportys.com

Vertex Standard
714-827-7600
www.vertexstandard.com

Aeronca Champ

A basic taildragger that will offer you the sky without emptying your wallet.

Flying low and slow with the occasional whiff of honeysuckle through the open cabin window is what flying an Aeronca Champ is all about. There's a certain romance tagging along with a rag-and-tube two-seater that's left over from the post-World War II heyday.

Moreover, the Aeronca Champ is perhaps one of the few remaining inexpensive-to-buy, inexpensive-to-own, tandem-seaters on the market. You can even buy a new one—more on that later. It's also an LSA so sport pilots can fly it.

Champ owners will matter-of-factly say they own a Cub-like set of wings for far less money, and have just as much fun.

MODEL HISTORY

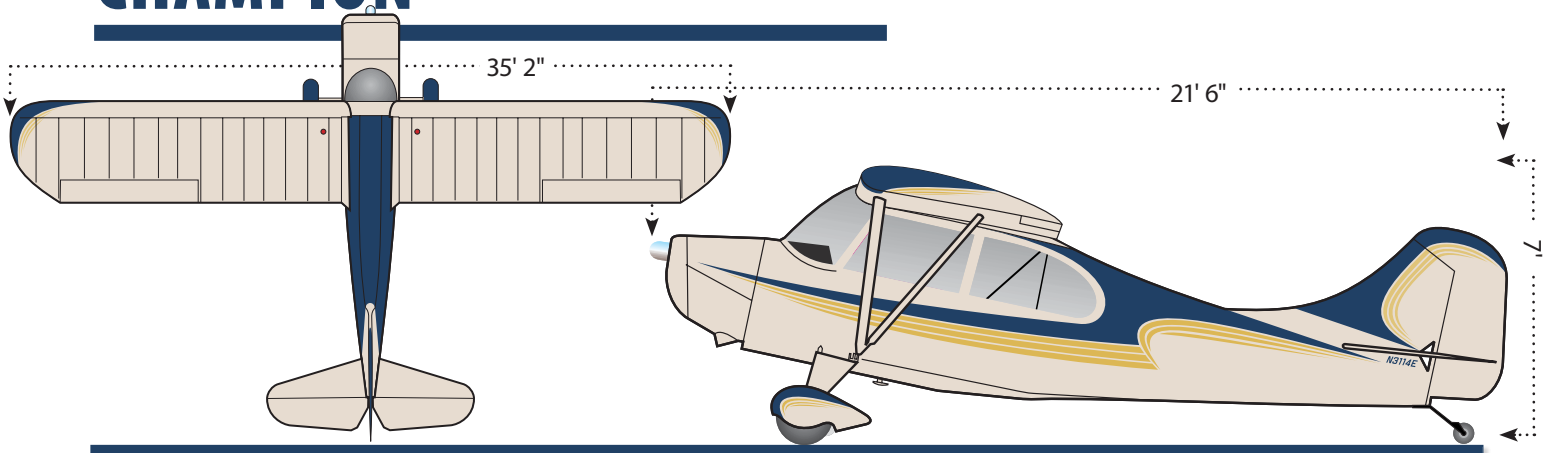
The first C-model Aeroncas appeared in the late 1920s with the model Ks and early Chiefs arriving in the 1930s. The popular 7AC Champion was introduced in 1945 and when production of the model 7AC Champion stopped in 1948, 7200 copies had rolled off the line.

The Champ is similar to other stark trainers of the vintage. It has conventional landing gear, sports a strut-based wing and is made of tube and fabric, of course. A 13-gallon fuel tank mounted just forward of the instrument panel feeds a diminutive 65-HP Continental engine. The year 1947 saw the introduction of Champs with more authority: the 7CCM that had a 90-HP Continental and the model 7DC that sported 85-HP. These are rare birds with only 184 DCs and 124 CCMs produced.

Production of the two airplanes ended in 1950 and 1949, respectively. Notable other postwar Aeroncas were the Chief (a side-by-side Champ) and the four-place Sedan.

The industry slowdown of the 1950s killed off Aeronca production, although the line's genes found their way into the Champions, which appeared in the mid-1950s and morphed into the better-known Citabrias, which are still built under new model names today by American Champion Aircraft (ACA). The "new" Champ labeled 7EC (not to be confused with the 1957 7EC Traveler) has been in manufacture since 1995 and is powered by the Continental O-200.

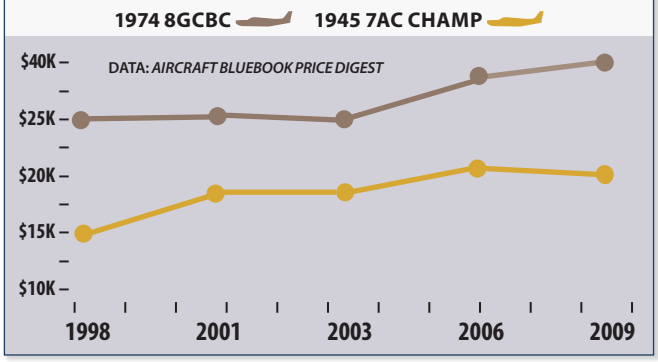
CHAMPION



SELECT AERONCA/CHAMPION MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1945-1948 7AC CHAMP	65-HP CONT	1800	$16,000	14	460	70 KTS	±$19,000
1947-1950 7AC CHAMP	85-HP CONT	1800	$16,000	14	460	70 KTS	±$20,000
1947-1950 7CCM CHAMP	90-HP CONT	1800	$16,000	19	490	78 KTS	±$22,000
1947-1949 7DC CHAMP	85-HP CONT	1800	$16,000	19	500	78 KTS	±$23,000
AMERICAN CHAMPION SELECT MODELS							
1955-1962 7EC	90-HP CONT	1800	$16,000	26	600	97 KTS	±$21,500
1964-1973 7ECA	100-HP CONT	1800	$20,000	35	583	107 KTS	±$25,000
1960-1964 7GCB	150-HP LYC	2000	$21,000	35	500	110 KTS	±$23,00
1967-1976 7GCBC	150-HP LYC	2000	$21,000	35	500	111 KTS	±$28,500
1968-1976 7GCAA	150-HP LYC	2000	$21,000	39	510	109 KTS	±$30,000
1977-1984 7GCBC	150-HP LYC	2000	$21,000	35	500	111 KTS	±$42,000

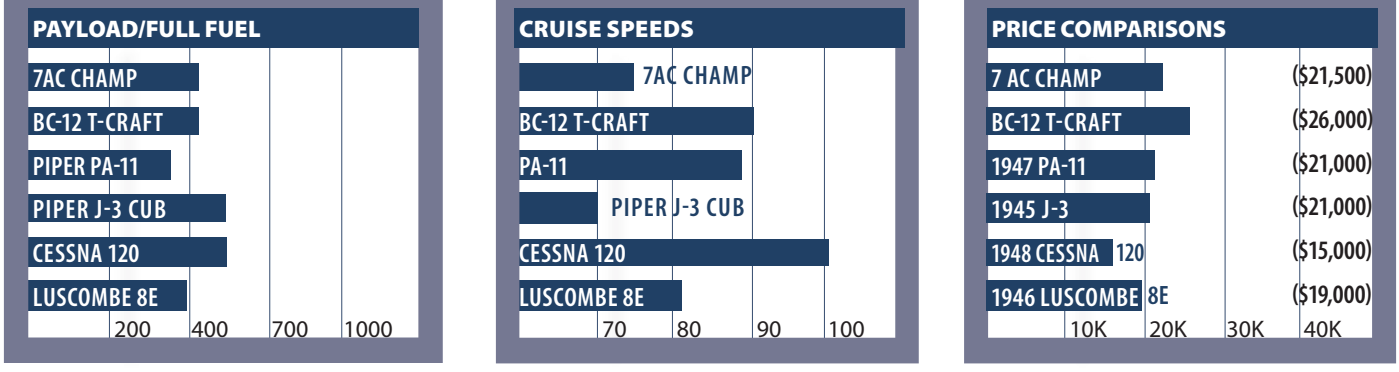
CHAMPION RESALE VALUES



SELECT ADs

AD 1947-30-01	(7AC) LIFT STRUT WING ATTACHMENTS
AD 1947-30-05	(7AC) EXHAUST STACK Y JUNCTION INSPECTION/REPLACEMENT
AD 1948-39-01	(7 SERIES) REAR STICK SOCKET MOUNT
AD 1949-11-02	(7 SERIES) WING ATTACHMENT FITTINGS

SELECT LATE-MODEL COMPARISONS



This panel is cluttered for a Champ—it has a turn-and-bank. Note that mags, fuel and carb heat are on the black panel just to the left of the front seat. Ergonomics are not a strong suit for a classic Champ.

STILL A BARGAIN PRICE

Back in the day, a new model 7AC Champ cost $2395, which was $200 more than a Piper J-3 Cub. A vintage Piper Cub is now worth more than the Champ, probably because of the standing Cub image. Most Champ owners will matter-of-factly say they own a Cub-like set of wings for far less money and have just as much fun.

For this reason, it's no surprise bargain hunters caught onto the Champ's appeal. The going rate for an average-condition Champ today is nearly double what the airplane was going for in 1992. The Champ (and Cub) market has changed because they are now considered classics. For years, airplanes like this were a ticket to cheap ownership. But most are now worth considerably more than many modern and newer two-seaters.

Some Champs are still cheap. The Aircraft Bluebook Price Digest pegs a 1972 7ACA Champ at an average retail of $16,000—some $2500 less than a 1977 Cessna 150. Contrast this to J-3 Cub prices that run $20K-$35K. Prices on the Champ and Cub can vary greatly and are dependent on the quality of restoration work done, and a pristine Champ can command near-Cub prices.

But with a good eye, it's possible to find a bargain. One owner told us he found a pristine 7AC sitting in a barn in rural Vermont, the deceased owner's wife happy to unload it. Further, the cost of ownership is about as low as it gets since you'll burn less than 5 GPH. Better yet, many Champs have autogas STCs. Since these airplanes are so simple there really isn't an awful lot to maintain (or break).

FLYING IT: USE YOUR FEET

Strap into a Champ and you're sitting in one of the most basic set of wings around. No frills here. That's not to say the airplane doesn't command respect when it comes to managing stick and rudder skills. Too often tailwheel beginners get behind on directional control and find themselves bouncing over runway lights, into the tullies or a drainage ditch. Hardly a nostalgic day.

But up at altitude, coordinated stalls are essentially a non-event. Cross-control stalls are another story. If you aren't paying attention they can bite without much warning. Speaking of which, the stall warning system was still a dream when these airplanes were built so you'll need to fly the wings and remain mindful of keeping the skid ball centered.

If you approach flying the airplane by airspeeds and not by the seat of your pants you're already off to a bad start. Your senses will eventually learn what the right numbers are.

The Champ's stall behavior is much in line with two-seat airplanes of the postwar era, which likely explains the models ugly stall-spin accident record.

Don't be in a hurry to get to your destination in a Champ. You can expect to cruise at a leisurely 80 MPH. A Luscombe and speeding freeway traffic down below will outrun you. A Piper Cub won't.

Takeoff is straightforward and Champ's low wing loading makes dealing with short fields child's play. Only a few hundred feet of ground run is needed. This is good because clearing tall trees with 65 HP yielding 400 FPM of climb could induce some pucker factor.

As long as you keep those cross-control stalls in the front of your mind, the Champ loves to slip and landing is fairly simple. Most owners will rave about easy wheel landings but like any taildragger, you fly it to the tiedown.

LOADING, COMFORT

The Champ is light. Gross weight is only 1220 pounds. But there's not much to the basic aircraft. Expect empty weights around 740 pounds—about as much as a big motorcycle. That leaves 480 pounds of useful load, which means it's a decent performer with 78 pounds of fuel, a pilot, a passenger and a couple of bags. There's a small storage area behind the back seat.

You'll need to be careful to always tie the airplane down or the wind will send it flying, or at least rock it hard enough to crack a wooden spar.

Cockpit visibility in a Champ is better than most postwar draggers since it has large windows. The side windows slide open for some fresh air and to lessen the stench of fuel.

But expect the Champ's cabin to be drafty even with the windows closed and plan on wearing good headsets with full ear cups. All the classics of this vintage are loud. Hanlon-Wilson mufflers reduce noise somewhat. If you fly a Champ in cold weather regions, you'd better dress for the occasion as the heater

is essentially useless. The Hanlon mufflers do improve the heating, however.

SYSTEMS: NOT MUCH THERE

This airplane is about as stark as it gets. There's no electrical system (except for the later models), no flaps, no vacuum pump and few instruments. There's a tachometer, airspeed indicator, altimeter, compass and a stark engine gauge or two. Some Champs have been fitted with a venturi to drive a turn-and-bank indicator, but don't even try weather flying in a Champ.

Unlike the Cub's classic piano-wire-on-a-cork fuel gauge, the Champ has a dial that's shared with that in a Model A Ford. The gauge is set forward of the instrument panel which leads directly to a mechanical movement in the tank. As you would predict, these old Model A gauges can break; replacements are available though Bratton's Antique Auto Parts rebuilder's catalogue. Some Champ owners add redundancy by using a Cub-style wire-and-float gas cap plus the Model A gauge.

For original fuel systems, Bratton's has cheap repair kits to help solve the leaking fuel nag that ultimately makes its way into the cabin. Speaking of fuel systems, the fuel selector is a simple on-off valve located on a panel adjacent to the front seat back where either occupant can reach it. The mag switch and carb heat knob are also located there. Reaching the carb heat knob from the front seat can be awkward and easily overlooked since it's out of sight. Not much ergonomics in a Champ.

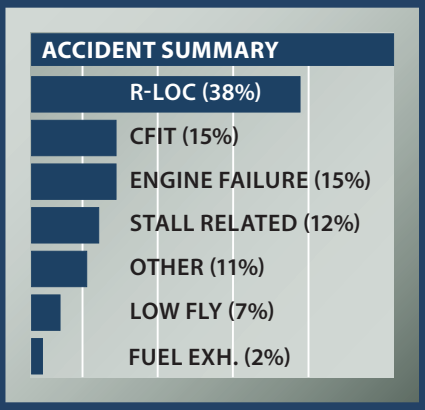
An STC is available for wing tanks, which increase flexibility when flying solo. With two aboard, there isn't enough useful load to put any gas in them.

The landing gear legs have oleo struts built in, making it more streamlined than a Piper Cub's bungee arrangement. Wonderful gear, the oleo struts, but brutally expensive to replace when damaged. Proper servicing—and good landings—are the keys to gear life. Owners comment there are reliable sources for quality gear repairs.

The braking system on a Champ is hardly substantial. There are two kinds of brakes—Goodyear mechan-

ACCIDENT SCAN: LEARN HOW TO LAND IT

A trip through the NTSB stats from the year 2000 to 2010 show 66 reported accidents for the 7-series Champs—eight of which included fatalities. Most of these fatals were from stall/spin accidents, including one ATP-rated pilot who stalled while maneuvering to scare birds from a field. Another was loss of control on initial climb. One pilot lost control of his Champ, killing himself and his passenger, and the FAA concluded it was the result of his restricted view of the instruments while flying from the rear seat. There was also the classic stall/spin on the base-to-final turn in the traffic pattern and the eye-rolling buzz job that didn't quite go as planned.



The Champ's reputation for a death-stall is somewhat undeserved and stems partly from a 1979 FAA study that concluded the airplane had the worst stall and spin record of the 33 aircraft reviewed. The Piper Cub had a stall-spin rate of 3.46 per 100,000 hours and Cessna's 150 had a rate of 1.42. The Champ came in at 22.47. While we wouldn't avoid the Champ solely because of its stall behavior, there's good reason to pay sharp attention when flying slowly, as you should in any plane.

Of the remaining 58 non-fatal accidents, there were plenty of non-fatal stall/spin events, and a good number of engine failures for undetermined reasons. Some fell victim to carb icing, which is no surprise as the Champ's carb heat capabilities are weak. There were some hand-propping accidents and, as always, a few pilots who just ran out of gas.

The biggest Champ bender was loss of directional control on the ground, including the dreaded ground-loop. Lesson: Get a real tail wheel instructor who's experienced with low-powered antiques to teach you how to start, taxi and fly the Champ. As a long-time Champ owner and instructor put it: "If you can't fly with your feet, you can't fly a Champ."

Photo by Paul Aranha

ical drums and Goodyear discs, both operated with heel levers. But this is a tailwheel airplane and having good breaks can be a setup for trouble as most wizened 'dragger pilots will warn. A couple of NTSB reports enforce this advice.

The wheels and hubs are subject to a recurring AD requiring an inspection for cracks. Replacements are expensive.

The original prop was wooden and more prone to wear than a metal prop. Wood props have noticeably less vibration in flight but metal ones, which are available through Wag Aero, give better performance. With no electrical system, you'll need to brush up on your hand-propping technique.

FIXING IT

Even though there isn't much to go wrong on a Champ, working on a 1940s vintage taildragger is not like repairing even a 1970s Cessna 172.

Mechanics who are well-versed with the intricacies of maintaining old ragwing airplanes can be hard to find. It pays to find one and team up with that person before shopping for an elderly airplane. In particular, it's a good idea to find someone who's good at dealing with fabric.

Two active type clubs are there to help. The National Aeronca Association (www.aeroncapilots.com) and the Aeronca Aviators Club (www.aeronca.org) both have many excellent resources to help with maintenance and to answer questions about the airplanes. A large collection of engineering drawings exists between the two clubs and is available to restorers.

Aeronca is gone as an airplane company, but parts are available from a variety of sources, including the ubiquitous Univair, Wag Aero (who bought the previous Safe Air Repair, including PMA-approved wooden wing spars), Superior Air Parts and the Citabria people at American Champion Aircraft. ACA owns the 7AC type certificate and offers a new Champ. There are a few bits and pieces that may be hard to find, including windshields, retaining clips for the disc brakes, cranks for the Continental engine and parts for the oddball—but magnificent—Eisemann magnetos.

There are also desirable STC'd upgrades available, including an O-200 engine from Cole Wagner, and a David Lasher 85-HP conversion. Wag Aero offers approved Cleveland hydraulic brakes. Slick and Bendix mags and parts are readily available, as is a 6.5-gallon fuel tank STC that increases capacity to 26 gallons (24 useable).

All Aeroncas with wooden spars have an AD to inspect for cracks. For the 7AC it's a one-time compliance; with other models it's a recurring inspection. You can get metal replacement spars and whole-wing replacements for the basket-case Champ.

THE NEW CHAMP

You can buy a new Champ from American Champion Aircraft in Rochester, Wisconsin (www.amerchampionaircraft.com). The same company that offers the Super Decathlon and Scout, among others.

It's the model 7EC and is powered by a O-200D Continental engine with 60-amp alternator, stainless steel exhaust and Sensenich 69-inch wooden propeller. There are options for avionics (some custom panels are available), electronic engine gauges, rear toe brakes, tinted windows and greenhouse roof, to name a few. There's also an available vintage 1946 paint scheme, but it's not a 1940s aircraft. The basic airplane has a starting price of $102,900.

OWNER COMMENTS

I purchased a 2007 Champ (number five off the line) from the factory. It is a Champ, but different from the 1940/50 versions. No gas tank above your knees, a Citabria metal-spar wing stressed to 5 Gs, aluminum spring gear, a Continental O-200 with an alternator and a starter, and an electrical system for things like radios, lights and transponders. Yes, it isn't "pure" with the electrical system, but I live near Washington, D.C. and cannot get along without a radio and transponder (which are optional from the factory).

The good news is that it is just as much fun to fly as the old Champs. If you are in a hurry, however, it's the wrong aircraft. Even with the extra horsepower of the O-200, 90 knots is about as good as it gets. And it is still fabric-covered, so you need to keep it inside if you expect the fabric to last. The wood prop looks classy, but has to be re-torqued every 50 hours. I live on a grass strip, and only have about 1000 feet available in the winter due to mud. The Champ does fine.

The airplane has been completely trouble free, except for the pesky starboard exhaust pipe, which has broken twice. American Champion replaced it both times with redesigned pipes at no cost. The second redesign seems to be holding.

The aircraft meets Light Sport rules, so you can fly with a driver's license, but it has a standard airworthiness certificate. One point often missed is that if an S-LSA manu-

The Champ is all about grass airports and flying for the fun of it. Spring gear is an obvious telltale of a modern Champ.

facturer goes belly up, the owners have little choice but to convert their aircraft to experimental status. Also, an S-LSA aircraft owner must comply with manufacturer recommendations for parts, tires, fuel and maintenance directives. This isn't the case with the Champ—the FAA maintains its airworthiness. If a part meets a spec or TSO, it can be used.

So if you want a fun aircraft, but need an electrical system, try the new Champ. You can see that the wife and I like this one, which is N91PV for Pat and Vince getting married in 91—you gotta sell airplanes to the wife, too.

Vince Massimini
Kentmorr Airpark, Maryland

I love my Champ. I fly large turbine aircraft for a living and I can't wait to get home to fly my 1960 7EC. It has a 90 HP with full electrics. It cost about $800 a year to insure and burns four gallons per hour. It's great fun. I look forward to teaching my kids to fly in it when they get a little older.

Sean W. Capper
via email

I've have owned a 1946 Champ 7AC in partnership with two other people for about eight years and have accumulated about 450 hours in it. The Champ is our "fly for fun" airplane and it doesn't get any cheaper. I doubt that an ultralight could even come close. We each get the airplane for a week in rotation from Thursday through the following Wednesday.

We hangar ours (required for any fabric airplane that you care about) and our fixed expenses are $984/year for the hangar, about $360 for insurance and $140 for an annual. That's a total of $1484 a year fixed expenses, or about $500 for each partner.

We have an auto-fuel STC and average about 4.5 GPH. At my usual 80 hours a year, my cost to fly comes out to be about $11/hour. The only big expense we've had in the eight years was a top end on all four cylinders last summer for $600. Needless to say, we do most of the maintenance ourselves under an A & P's supervision. The airframe and A-65 engine are stone simple to work on. Unfortunately, not many mechanics understand these old airplanes and the ones that do are dying off.

Ours was acquired as a basket case and when it first flew, we each had about $1500 in it. We added two 6.5-gallon STC'd wing tanks when we covered it, giving it 24 gallons usable.

Climb is anemic, cruise is at 83 MPH (faster than a Cub, slower than a Luscombe), ventilation and view are tremendous (both windows open on ours), cabin heat is nonexistent, the noise is incredible and the brakes are not to be trusted.

The gear is not as strong as a Cub's so you should avoid dropping it in, but the oil damped struts make landings smoother. You can easily operate it in and out of 300 feet (no obstructions, of course) on grass without using the brakes.

Useful load on ours is 440 pounds. With full fuel that leaves 284 pounds for people with five hours of fuel usable. A more rational 13 gallons for 2.5 hours leaves about 360 pounds for people. But the extra fuel comes in handy when you're going somewhere by yourself and won't have fuel available when you get there.

About the brakes: There are two kinds of Goodyear brakes found on the Champs. The disc brakes are better but they are held in place with clips that are made of expensivium and they occasionally pop out and get lost. The brake pads are made of the same material. Just check the Wag-Aero catalog and you'll see what I mean.

The drum brakes are cheaper to get parts for, but there is a mandatory AD requiring inspection of the drum/hub for cracks every 50 hours. Neither brake system is very effective but that is probably a good thing with any taildragger.

The good news is that if you plan your flying so you don't use the brakes except for run-up, you won't put much wear on them and they'll last a long time (we have yet to replace ours in 1100 hours but we have lost several clips).

Bottom line, more fun for less money than you thought possible in aviation. Forget ultralights and if you don't have a medical, get a Champ.

Joe Scalet
via e-mail

The Aviation Consumer

Letters

(continued from page 3)

serious IFR practice with desktop PCs. This valuable resource is not utilized by many IFR pilots. I have X-Plane, FSX and FS 2004. They all have value.

I fly a Cirrus SR-22 with Avidyne EFIS and only FSX gives detailed accurate knob turning, using Avidyne student and Reality XP 430s. The X-plane has no compatible systems with accurate avionics for the SR-22, but does for other aircraft.
My main point (the same as yours), is not to promote one system over another, but to share my enthusiasm over the real and valuable IFR experience one can get on your home computer.

If you think you are proficient, challenge yourself to getting in a desktop C-172 in any brand simulator and set weather to 200 feet, 1 mile and do an ILS (with no autopilot).

Lee DeRosa
Bath, Maine

SPOT ON

My aircraft is equipped with a 121.5 MHz ELT, which are now obsolete. So I have a SPOT satellite messenger and have been using it in my aircraft since September 2008. My family and I are very pleased with it.

Your description of the SPOT fails to describe how versatile the device really is. All of the outgoing messages can be custom configured to relay specific information in a manner of your choosing and these settings are saved online in a profile. Each SPOT device may have more than one profile ready for use, each with custom messages and recipients. These profiles may be selected as active via internet connection before your trip.

My standard message goes to my wife's cell and her office computer, our son's cell, my designated emergency friend and my cellphone. If we are flying to visit a relative, we add their cellphone to the list and send out an OK message a half hour before getting to the airport, so they know when to pick us up.

The 911/SOS message does not map to recipients in the same way. A primary and a secondary emergency contact are designated on the profile along with their contact information.

Here is how we use the SPOT for a local fly: During preflight, once the airplane is out of the hangar, I turn the SPOT on and send an OK message after it stabilizes for about 30 seconds.

I clip my cell to my shirt pocket and continue preparing for the flight. The cell usually pings the text message on taxi to the run-up area. Once the cell pings the message, I reset the SPOT and put it in TRACK mode. I put the SPOT on the dash and try to keep it in the shade of the windscreen center post.

During the flight, my wife will often open the SPOT shared page and follow my progress from her office computer. If I have to divert or have a non-emergency delay, I can send a HELP message, letting everyone know that I have been delayed.

When I land, I reset the SPOT and send another OK message, letting everyone know I am on the ground and the trip was completed safely. If I were to have an emergency in flight, I would simply press the 911/SOS button. It takes less time to do that than to reset my transponder to 7700 (a feature of the new transponder I don't like). If I couldn't do that, the SPOT would still have my track to within 10 minutes of my current position. The 911 feature on the new SPOT2 sends a message every five minutes, but I think it is more often than that on the SPOT1.

I have had the SPOT for nearly two years and I like it a lot. While the SPOT system is not perfect, it does work and has some very handy features. The shared page feature is very informative and entertaining for my family and adds a level of usefulness not possible with an enhanced ELT.

William "Pete" Hodges
via e-mail

FEEDBACK WANTED

CESSNA 172

For the October 2010 issue of *Aviation Consumer*, our Used Aircraft Guide will be on the Cessna 172 Skyhawk, a classic everyman's airplane if ever there was one. We want to know what it's like to own these singles, 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 Hawk by August 1, 2010, to:

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