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FIRST WORD

VULCANAIR'S RUN AT THE SKYHAWK

When I heard that Italian aircraft manufacturer Vulcanair earned an FAA type certificate for its V1.0 four-seater this past December, for some reason my mind did a rewind to a time when Fiat was trying to sell its X1/9 targa sports car in the American market. The two have absolutely nothing in common, of course, but everything in common when it comes to market acceptance and support confidence. Thankfully, the X1/9 went away in 1982. Tony will never have to fix many of them again. These days Fiat is enjoying better American market acceptance with a few new models that seem priced just right. Whether the American airplane market will embrace a Skyhawk look-alike from Italy is anyone's guess, but Vulcanair might be nicely positioned for success.

You might not know a lot about Vulcanair, but you might have seen one of its airplanes, the P68, and wondered what it was. What you saw is the Partenavia SF600, which is a sleek, six-seat, high-wing, Lycoming-powered light twin. It was Vulcanair that around 1997 purchased the assets, type designs, trademarks and tooling for the SF600 from Siai Marchetti. The P68 series comes in different variants and has an earned reputation for being a workhorse for airborne law enforcement, firefighting and aerial surveying, and it is flown by multiple U.S. government law enforcement and wildlife conservation agencies. Vulcanair is, in my view, a success in a fragile market. And now, with U.S. certification of the V1.0 under its belt, the company is making a run at the Cessna Skyhawk market, while targeting flight schools, flying clubs and private owners.



Vulcanair is off to a good start with its model V1.0, earning serious respect for being serious. When it showed the airplane at AirVenture last summer, company CEO Remo DeFeo said it would be FAA certified by the end of 2017 and he wasn't kidding. The V1.0 is one of those airplanes that from a distance passes as a Cessna Skyhawk and that's intentional. But get closer and you might think it's a Skyhawk on steroids, evident by the third cabin door on right side of the aircraft. That door had me digging the airplane right away. It would be easy to load in my snowboards and a folding bicycle. The other striking detail about the V1.0 is the price. Fully equipped for IFR, it will sell for around \$260,000. Check that against a new Skyhawk that is priced near \$400,000.

Previously certified in Europe, the all-metal airplane is FAA certified in the utility category and is powered by a 180-HP Lycoming IO-360-M1A slinging a constant-speed Hartzell propeller. The engine is certified to run on both 100LL and ethanol-free/lead-free mogas. DeFeo said the company isn't ruling out a diesel option in the future, but not now. Cessna's Skyhawk comes standard with Garmin's G1000 glass cockpit, but the V1.0 I saw over the summer had Garmin's retrofit G500, a Garmin GTN650 navigator, a big-screen digital engine display and a Mid-Continent SAM digital backup EFIS system, plus an angle-of-attack system. Garmin recently announced its new TXi series displays—which will replace the G500—so it wouldn't surprise me to see them in the Vulcanair. For the price savings, I think the majority of buyers will be just fine without a G1000, but will demand an autopilot.

The airplane has an 88-pound baggage capacity (accessed just aft of the third door on the right side of the fuselage), a 50-gallon usable fuel capacity, an 882-pound useful load and a 135-knot cruising speed. Takeoff and landing distance is advertised at 1440 feet. The V1.0's cabin structure is made of steel tubes under an aluminum wing. As for support, the current U.S. distributor is Ameravia (which reports 60 orders for the V1.0) in Miami, Florida. We're planning a full flight evaluation of the Vulcanair later this spring.—Larry Anglisano

SEAT BELT FEEDBACK

I was reading the December 2017 issue of *Aviation Consumer* and noticed that there were two areas you covered that didn't jibe with my experience. First, seat belt re-webbing.

You imply that re-webbing a seat belt is simple and cheap. My experience is that it can be far from so. For newer (1997 and beyond) Cessna aircraft, the seat belts are "dynamically certified." This apparently means that it is quite hard to find a place that will re-web them (none of the vendors mentioned in your article will). I got a quote of \$2147.30 per belt the last time I asked about this a couple of years ago. Insane. Is this only a problem with newer Cessnas, or does it apply to all newer aircraft?

The other issue is with the Cessna Pilots Association. This organization sadly appears to have degraded to the point where I think you are doing a disservice by recommending it. If you want to point readers to an active Cessna owners community, there is a thriving one at www.cessna-pilots.net (which is where many of the forum members from www.cessna.org migrated when their forum died).

Chris Colohan
via email

You are correct; we're told that newer Cessna belts are unique and it has everything to do with the original certification process. The short answer is that the majority of aircraft seat belts were manufactured under a specific TSO. But when Cessna went back into production, it installed load-attenuating seats and certified the seat belt along with them as a combination. Shops tell us this doesn't make a field replacement belt an easy option due to the recertification process. So where do you go? You guessed it—Cessna.

As for the Cessna Pilots Association, we've heard similar reports from others about a serious decline in what used to be the best type organization around.

Many of the complaints stem from its deteriorated technical support and a broken web forum. We've heard from reliable sources that the organization is working to rebuild itself, so we'll follow up periodically on the progress.



HOT STARTS

I enjoyed your article on taming hot starts in the November 2017 *Aviation Consumer*. I used to own a Belanca Super Viking and it was terrible to start when hot. A long-deceased CFII,

Charlie Ratliff, advised me to stop the engine by turning off the fuel with the fuel selector. That way, when starting the engine after refueling there was no hot fuel or vapor in the lines, only cold, fresh fuel. I never again had trouble with hot starts. I have used that technique on other airplanes, with good results.

Harry Wander
via email

SIRIUSXM IN CANADA

Thanks for the review of Garmin's new GDL51 SiriusXM weather receiver in the November 2017 *Aviation Consumer*. I recently purchased the GDL51 and have attempted to get it activated here in Canada for use with my aera 660 portable GPS. It appears SiriusXM Canada does not yet have subscription service for the SXM data feed that seems to be replacing the older legacy XMWX data feed.

I attempted to sort this out, but no one at SiriusXM Canada seems to know anything about the differences. I was able to activate the GDL51, but get no data as the Garmin Pilot app does not recognize a valid subscription. From what I can tell the hold-up in services via SiriusXM here in Canada may be related to U.S. FCC rules. Any ideas on this? This is a bit frustrating, as technology is progressing, but one can't make use of it.

Richard Smith
via email

SiriusXM says the only data feed

that's currently available for Canadian subscriptions is the XM WX Aviation Weather, but couldn't offer much of an explanation why the newer subscription package isn't available. We're told that the newer data feed isn't a replacement for the legacy weather packages.

It currently offers the Aviator package, priced at \$54.99 per month, and the Aviator Pro at \$109.99 per month.

ICOM'S NEW RADIO

I read Larry Anglisano's thorough field report on Icom's new A25N portable radio in your January issue, but I couldn't figure out if the lower-cost A25C is equipped with the GPS receiver.

Bill Stetson
via email

The comm-only A25C does not have built-in GPS or Bluetooth.

CORRECTION

In the mountain flying training article in the January 2017 *Aviation Consumer* we wrote: "Much of the flying will be over valleys, but on the upwind side of the valley because that's where the updrafts are."

We got that just backward. The updrafts are on the downwind side of the valleys where the wind is flowing up the side of the valleys.

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Ovation Ultra: Fast, Efficient, Refined

Mooney bumped up the power, added a pilot-side door and torted up the avionics and interior. For some buyers, the combination will resonate.

A popular (and lazy) journalistic toss away is to describe a company as “owning” a market. Yet no company does, not even 800-pound simians like Garmin

BY PAUL BERTORELLI

and Cirrus. There are always buyers swimming against the tide and in the world of aviation, Mooney has made a business of scooping them up; a flea in a world of elephants.

Now, after an infusion of Chinese capital, Mooney is campaigning with two new models, the Ovation Ultra and Acclaim Ultra, the latest refinement of a basic design idea that emerged in the 1960s. With the addition of a second door on the pilot's side, a dose-up in horsepower and new avionics and interior, the M20U Ovation will go head to head with the Cirrus SR22, the normally aspirated airplane that accounts for nearly half of Cirrus sales. (For Mooney, sales are lopsidedly tilted toward the turbocharged Acclaim, evidently because Mooney buyers are more speed obsessed than Cirrus owners.)

Who's the Ovation for, then? Probably for owners who avoid the Rockies and the Sierras and would rather snort chili powder than fly

with a cannula poked in their nostrils. And surprisingly, some people who can afford to spend most of a million dollars for a new airplane actually want one that's efficient. I recently flew the new airplane with Lee Drumheller, a sales exec with Premier Aircraft.

REINVENTION AGAIN

Mooney is the aerospace equivalent of the Phoenix, having endured bankruptcies, sales and reorganizations and each time reinventing the basic design. The M20Cs/Es were stretched to become the 201, the 201 was stretched to become the “long body” Ovation and Acclaim and now the Ovation has been tweaked yet again to become the M20 Ultra.

It's similar to the last version of the Ovation, the M20R Ovation 3. It appeared in 2008 just before Mooney went dark on production after the economic downturn. At that point, Mooney had tweaked the IO-550-G from 280 HP to 310 HP, with no full-power limitations. But other changes were cosmetic.

The Ultra is a more comprehensive redo, according to Mooney. The pilot-side door is the biggest change and both doors are wider, so the

CHECKLIST	
	Mooney continues to stretch the basic cage/monocoque airframe.
	Along with the stable-mate Acclaim, Mooneys are the most efficient gasoline aircraft. Period.
	Despite sleights of the tape measure, the cabin is still tight compared to a Cirrus.

rear passengers' shot into the back is easier. Both composite doors have new latching mechanisms with a robust rod to open and close the door with a thunk.

As shown on page 6, Mooney engineered the door by shuffling around the welded 4130 tubing used for the forward fuselage cage. Aft of the rear seats, the airframe is traditional monocoque riveted skins over frames.

During this rework, Mooney realized that to compete, it would have to squeeze build hours out of manufacturing a high-parts-count airframe. In the name of efficiency, it replaced the metal skins over the forward cabin with a single-piece composite buildup. While this is a wash on weight, it allows workers open access during the final phase of construction before the cabin is closed in. Also, the composite is clipped on, rather than riveted, saving more labor.

The company is bullish enough on volume—and perhaps anticipating resumption of the stalled M10 trainer project—to have installed a new composite-curing autoclave at

Efficiency combined with speed derive from the 310-HP Continental IO-550, lower photo, swinging a three-blade Hartzell prop. Standard panel features Garmin G1000 NXi with a pedestal-mounted keyboard, middle photo. Precise Flight SpeedBrakes, bottom photo, are standard equipment.



Kerrville. Thus, as many companies are doing, it's taking back in-house the manufacture of parts that were previously farmed out.

NEW STUFF

Other big changes in the Ultra include a new interior and a new avionics suite. The seats offer more lumbar support and are upholstered in a style best described as luxury-sports-sedan plush. And yes, getting into them is easier, although I found the ingress/egress from the left side slightly weird after years of sliding in first from the right side.

As we reported in the February 2017 issue of *Aviation Consumer*, the Garmin G1000 NXi is an evolutionary upgrade to the G1000 suite that has been standard in virtually all new aircraft for more than a decade.

Two things about it are immediately noticeable: It's brighter and the screens refresh much faster. It's also quicker to initialize, so no more idling on the ramp waiting for the navigator to find itself. It also sports some additional features, including a pedestal-mounted keyboard for input and a runway approach feature for VFR flying sophisticated enough for the autopilot—the GFC 700—to even fly vertical profiles. The display includes some new capabilities such as thumbnail data displays inside the HSI and highway-in-the-sky boxes. Glass panels require backup instrumentation and Mooney does that with the Mid-Continent MD302 SAM.

The G1000 is so complete that the avionics option list is short. It's equipped standard with ADS-B In/Out and the Flight Stream 510 cockpit connectivity option that allows uploading data from tablet apps to the G1000. Garmin's GTS-800 active traffic is an option, but Drumheller says that the ADS-B TIS-B works so well that active traffic is

superfluous.

Also upgraded is the electrical system and panel switchery. Previous long-body Mooneys have had two batteries and two alternators and so does the Ultra. The backup alternator has a 30-amp capacity and will operate an essential bus that's clearly segregated on the CB panel mounted in front of the copilot seat. The old-style rocker switches have been supplanted by modern, backlit switches and the panel itself is illuminated with LEDs for operation after dark.

Mooney also redesigned the flap and rudder trim controls. The flaps are handled via a flap-shaped, two-position switch on the lower panel and the electric rudder trim via a simple knob. Positions of these surfaces are annunciated on the G1000, adding to what can be a cluttered display of information.

PERFORMANCE, PAYLOAD

Nothing exists in a vacuum, which is to say Mooney's success, at least some it, will come from siphoning sales from Cirrus and perhaps Cessna's TTx. How would the three look to a potential buyer comparing them?

First, payload. The Ovation we flew had a useful load of 1050 pounds on a gross weight of 3368 pounds. Standard fuel is 100 gallons, so with full tanks, that leaves 450 pounds for people and stuff. The Ultra, then, is a two-person airplane with generous baggage or a three-person ride if down fueled by about 20 gallons. The SR22—the



direct competitor—has a useful load of about 1200 pounds on a gross of 3600 pounds, so it's not really a seats full, tanks full airplane, but can get there with little down fueling.

This, in part, may account for why Cirrus dominates the single-engine high-performance market



ABOUT THAT DOOR

The photo above shows how Mooney opened up the left side of the welded cage and added additional tubing to carry the loads around the door frame. The overall shape of the forward section of the aircraft also

expanded slightly and the doors are four inches wider than in previous models. Mooney told us its structural analysis shows that the airframe is actually stronger than before the modification.



and why sales of the SR22 and turbocharged SR22T are almost evenly split. Even though surveys consistently find that most piston GA trips carry just one or two people, buyers apparently want the option of backseats they can really use.

Except some would rather go farther and faster with the rear seats full of stuff or nothing at all. These are the probable Mooney buyers.

Head to head against the SR22, the Ovation Ultra flies farther, is faster, and burns less gas than the Cirrus. For all-out range on full tanks, with a 45-minute reserve, the Ovation Ultra can manage 1154 still-air miles against the Cirrus'

872 miles—a range delta of 32 percent. It will get there faster, too.

Non-turbocharged aircraft typically reach their cruise stride at 8000 to 10,000 feet. Climbing above that without a turbocharger dings cruise speed because of diminishing engine power. Still, the Ultra is a solid 190-knot airplane at these altitudes using best-power

throttle settings. Dial it back to best economy and the speed is still 180 knots. The SR22 is eight to 10 knots slower.

It's also a little thirstier. At 8000 feet and 75 percent power, the SR22 will cruise at 180 knots and 17.8 gallons. The Mooney will do 190 knots on 15.9 GPH. Thus is the payoff of a lighter, smaller airframe with landing gear that folds up. And by the way, the Ultra's gear is the same as Mooney has ever used, a tube-and-bellcrank design driven by an electric motor.

The backup is the same cable-pull system on the floor between the two seats. Along with the Bonanza system, this has proven to be a reliable, almost fault-free design. Our report on gear-up landings in the October 2017 issue unearthed plenty of Mooney gear-up landings, but few if any were caused by mechanical problems unrelated to what was between the pilot's ears.

FLIGHT IMPRESSIONS

If I was expecting my flight in the Ovation Ultra to offer revelations, I was to be disappointed. But I didn't and I wasn't. It's no surprise that the Ultra flies exactly like any of the modern Mooneys of recent years. Actually, anybody who had flown an old 1960s E or F model would sense the early DNA in the Ultra.

For a fast airplane, the Ultra feels lightish, accelerates well on the runway and once it has gathered itself up in the way Mooneys seem to do, it climbs well. On the videotape I'm heard to exclaim about a 2000 FPM initial climb, but 1500 FPM is more like it. Mooneys are not light on the controls and neither is the Ultra, once air loads impinge on the surfaces. The control circuitry is the standard rod-and-tube which is surgically precise, but not feather light.

I'm sure most owners will fly the airplane through the GFC 700 and this probably makes sense

continued on page 8



The Ovation Ultra is equipped with two alternators and has an essential bus, upper left, so the backup can handle the load. Nestled between two NXi displays is a Mid-Continent SAM backup EFIS.

MOONEY'S PLACE IN THE UNIVERSE

Buying a new airplane is both an act of passion and an act of faith. The very idea of sinking so much wealth into an asset used but 100 hours a year has to be driven by blind love for flight. The faith part has to do with the company remaining solvent to support such an investment.

Anyone looking at the sales graph below might understandably have second thoughts. And not just about Mooney, but the industry in general. But readers and would-be buyers do ask us from time to time if these companies are on solid financial footing. Without the luxury of reviewing the company's P&L, we can only guess. But we do ask around.

The chart shows or at least implies that Mooney's economics are very different from those at Cirrus. The last high water market in GA sales occurred in 2007, when the industry sold 4276 aircraft. (That's everything in GA; not just pistons.) That year, Mooney sold 79 airplanes. Its best recent year in the modern era—since 1997—was 100 aircraft.

But can a company survive on such low production? Evidently it can, because even in years of producing no airplanes, Mooney kept the lights on, building parts and servicing 60 years' worth of installed base.

We don't know the size of the investment the China-based Meijing Group made in Mooney, but the company's marketing director, Lance Phillips, says the investors are committed to sustaining the Kerrville operation. It has, however, placed in stasis the M10 trainer project it announced in 2015.

That model's conceptual framework was developed in a skunkworks operation in Chino, California, but that shop has since been darkened, if not totally closed. When I visited Kerrville in early 2016, the company was considering building an M10 production line. That work has since been reduced to a simmer; not cancelled, but not front burner, either.

In April 2017, the company's then-

CEO, Vivek Saxena, stepped down and has not been replaced. Phillips said the company hasn't made a decision on a new executive.

The current laser focus is on improved manufacturing efficiency for the M20 models. "Coming up to full speed, on really a new product, we need to scale. I want [the team] focused on the next iteration of the M20," Phillips says. Is there yet another model under consideration? "I think a lot of things are under consideration," Phillips says, but Mooney sees potential in the training market.

He believes Mooney is in a strong sales position because it can focus solely on its two piston models, while Cirrus is distracted by its jet sales and Textron has drifted from its commitment to piston aircraft. "We have an opportunity now that Mooney really hasn't had before," Phillips adds.

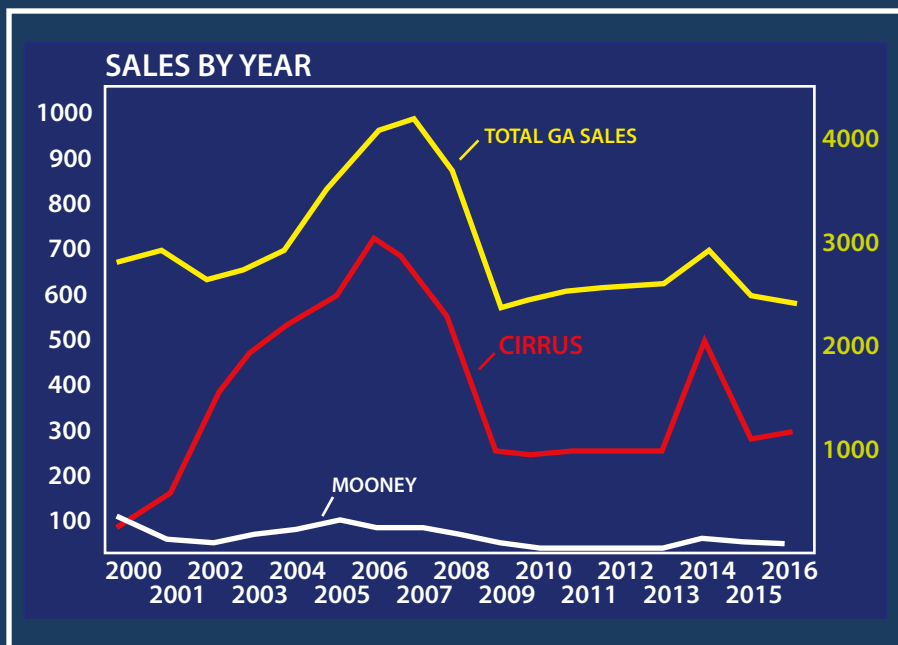
The view from the field is similarly bullish. Premier Aircraft's Lee Drumheller said he was busy courting qualified buyers and in a strong economy and stock market, they're more readily pushing the button. Premier principal Fred Ahles agrees.

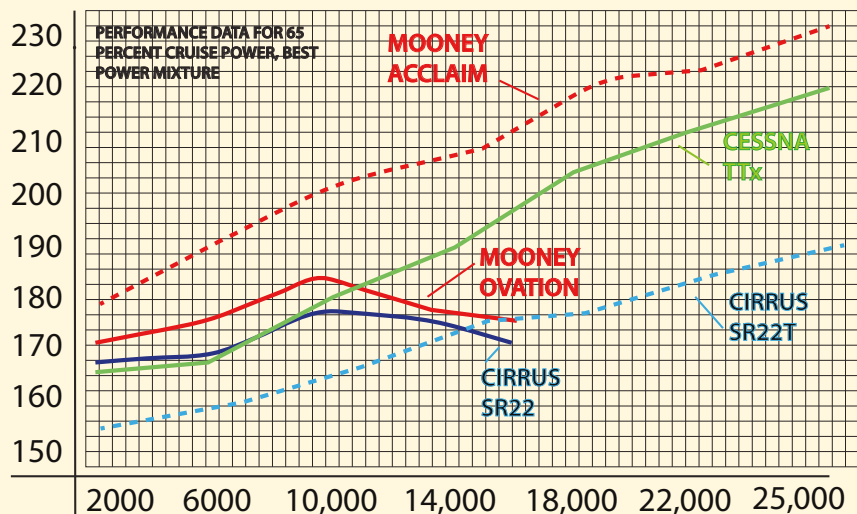
"Sales have been bad for so long for no good reason. People just had no confidence. But over the last year,

they've started to gain confidence," Ahles says. The recently passed tax reduction, predicts Ahles, will stimulate sales of new aircraft.

"I get a lot of people in here who own small businesses. So what's a guy gonna do who all of a sudden gets \$200,000 in his pocket? I'd say the answer is either reinvest in his business or buy something for himself, or some combination," Ahles says. When I spoke with Ahles just after the tax bill was signed, he said Premier already had a number of aircraft deals near completion. He expects to see more in 2018. Ahles agrees with Phillips on the timing. "Mooney is coming to market with the best high-performance single when the fish are biting," Ahles says.

Mooney announced the M10, below, at the Zhuhai airshow in China in 2015.





EFFICIENCY COMPARED

Mooney has always claimed that its aircraft are both faster and more efficient than the competition and the chart above seems to confirm the point.

We developed it from data published in the POHs of the top five high-performance single-engine aircraft: the Mooney Acclaim and Ovation, the Cirrus SR22 and SR22T and the Cessna TTx. The data show that the Ovation is faster than the

SR22 at all altitudes, regardless of power settings. Moreover, because it carries more fuel and burns less of it for the equivalent speed, the Ovation has about 30 percent greater maximum range than the Cirrus does. Worth noting is how much faster the Acclaim is than the SR22T. At 25,000 feet, its best speed is 242 knots, compared to 213 knots for the SR22T. However, both Cirrus models carry more than the Mooneys.

because the NXi system requires so small amount of head-down time to manage. Its operating logic will be familiar to anyone used to the original G1000, but learning the keypad and a few new features takes time. Shared with the touchscreen G3000 used in more expensive airplanes is the highway-in-the-sky feature. Personally, I can take it or leave it. The knack is to not try to fly up the center of the boxes but to use them as basic visual orientation to where the desired course lies in space. To me, it's just another form of needle chasing.

For any pilot capable of flying a target airspeed, obtaining a satisfying landing in a Mooney is of little challenge. It will float forever if the roundout starts faster than 80 knots, so I prefer to use about 75 over the fence. If you force it on before it's ready and land in a flat attitude, it will wheelbarrow with predictably ugly results.

When discussing interior cabin feel, Mooney acolytes will divert the conversation to the cabin's generous

legroom while insisting it's nearly as wide as other airplanes. Well, no. The cabin is still on the tight side, which I especially noticed when turning to retrieve a camera from the backseat. This still requires a little coggling with the front seat passenger.

Thanks to the NXi and elimination of the panel annunciators, the glareshield is an inch lower, opening up the forward view a little. But it's still more constricted than either the Cirrus or any of the Diamonds. The windows, by the way, are slightly larger in the Ultra. You'd probably notice if the older airplane was side by side.

Detailing in the interior is superb throughout, especially the seat construction and panel control layout. I could do without the electric rudder trim, but I suppose it's an expected feature in an airplane this expensive. After years of relying on aftermarket engine management technology, Garmin has finally gotten it right in the NXi. The leaning display is bright, visible and easy to use.

Speedbrakes are standard on these aircraft and are useful if you have to slam dunk the airplane. Otherwise, I prefer the more civilized method of planning the descent and wringing a few knots out of that expensively gained potential energy.

Ergonomically, Mooney has done about all it can with the M20 airframe. The seats, as noted, are much improved and cabin ventilation is abundant. Air conditioning is available as a \$28,900 option, but with two doors, I'm not sure it's needed given the gales that blow through on the ground and the Ovation's rapid climb rate to cooler, drier air.

Oxygen is a \$9900 option, but again, of dubious use for an airplane happy at 8000 feet. The same applies to the \$64,990 TKS known-ice package. That system costs both speed and payload and may not be a good choice for this airplane. The Ovation's base price is \$689,000 and Premier's Drumheller said typical invoices are in the low \$700s.

CONCLUSION

Comparing the specs and performance of the Ovation Ultra with the four other airplanes in this market space sharpens the focus on what it's good at. It's clearly a measurably more efficient airplane across the board, with the exception of payload. The Ovation Ultra flies farther, faster and on less fuel than its primary competitor, the SR22.

The tradeoff? It's just not a practical four-person airplane and even for two people, the cabin isn't as commodious as the Cirrus. More than one would-be buyer of a Mooney has told us this, even for those looking for used airplanes. And, of course, the SR22 has the parachute, the Mooney does not. CAPS is a strong sales point for Cirrus.

But for a buyer who wants to knock off a 1000-mile cross country in a day without fooling around in the flight levels and do it on minimal fuel, the Ovation Ultra is perfectly matched to that desire. And for those who want raw speed, there's always the Acclaim. We'll examine that in a future report.

You Tube See a video review of the Mooney at <http://tinyurl.com/j95ht2a>

ASA CX-3 Computer: Simple, Full Featured

ASA updates the CX-series E6-B electronic flight computer with a color display, faster processor and slimmer footprint.

by Larry Anglisano

At a time when nearly every pilot struts around with a tablet computer or smartphone running their favorite navigation app, we were surprised to see that pilot supplier giant ASA (Aviation Supplies and Academics) redesigned its CX-series flight computer.

Still, more than one high-volume mail order house, including Sporty's, told us the new ASA CX-3 computer is in strong demand. There's a reason for that. You can't take any FAA knowledge exam with any type of tablet or smartphone. But the dumbed-down ASA CX-3 is fair game, since it's authorized for use on FAA (and Canadian) exams.

Curious as to how dumbed down the ultra-modern new CX-3 really is, we ordered one to see if it's worth the \$79.95 asking price. Here's a field report.

GOOD ERGOS, BRIGHT DISPLAY

If you haven't taken an FAA knowledge exam lately, FAA Order 8080.6 and Advisory Circular (AC) 60-11 cover test aids and materials that may be used by airman knowledge testing applicants for all pilot, mechanic, dispatcher and other FAA exams. The CX-3 is fully compliant.

The redesigned CX-3 is the follow-on product to the ASA CX-2. At roughly 3 inches wide, 6.5 inches high and 3/4 inches deep, the .70-pound CX-3 feels like a big smartphone. Remove the plastic protective cover and it looks like a traditional handheld calculator.

The device is styled for stashing in a map pocket or flight bag, but we think the casing is too slick. It has a thin non-slip strip on the back to keep it

from sliding on a surface, but it came out of the hand in turbulence. Battery endurance is impressive on four AAA alkalines. Plan on 20 hours of continuous use when the device is set for full brightness.

We like that you can choose between four backlighting options, depending on the ambient light in the cockpit. In normal mode, the screen is backlit and the function keys aren't, while in daylight mode, the screen is always at full brightness (and the characters are black)—which works well in sun-splashed cabins. In the night mode, the screen has a black background (with green and white characters) and the keypad is lit. There's even a dusk mode—which turns down the display backlighting to medium-low.

ASA did a good job of keeping the CX-3's menu structure shallow and it's nearly impossible to get lost in any menu. Think in terms of input and output. Any CX-3 function can be reached with a maximum of two keystrokes, and you can go directly to the Flight, Plan, Timer, Calculator and Weight and Balance menus with dedicated function keys for each operation.

To help ease the data entry process on the fly, the single-line inputs and outputs of each function are clearly separated on the display to distin-

We like the CX-3's slim footprint and crisp LCD display, but not the slick glossy case. A raised rubber keypad makes for no-nonsense data entry.

CHECKLIST



For the cost of a yearly app subscription, the CX-3 is a useful long-term cockpit accessory.



The device has a bright display, but also has night and dusk modes.



You can't use your smartphone or tablet for FAA knowledge testing, but the CX-3 is fair game.

guish between entered numbers and calculated values, along with their corresponding units of measurement. ASA says the computer's menu organization reflects the normal process for planning and executing a flight, which is true. The result is a natural flow from one function to the next with a minimum of key-

strokes. Logically, when planning a flight, simply work from the menus in sequential order as you fill in your flight plan





form. The computer prompts you for the input with an amber question mark, and the answers will display with a green equals sign.

Better yet, you can perform chain calculations where the answer to a preceding problem is automatically entered in subsequent problems. This saves the tedious effort of entering data more than once. And, standard mathematical calculations and conversions can be performed within each aviation function without having to back out of menus to get the calculator functions.

The CX-3 is smart enough to remember previously entered aircraft profile data (it remembers the most recent display of variables, whether it was an input or an answer) thanks to its non-volatile memory storage. This means stuff you use the most—like weight and balance base figures and trip planning constants—are stored in the computer until you perform a memory reset or remove the batteries. For software updates, the device has a Mini-B data port on top of the case.

Speaking of weight and balance, we like the Weight Shift Formula function. This computes the amount of weight that must shift to move the CG to a desired location in the airframe.

For large aircraft, there is the %MAC function, which expresses the CG as a percent of the mean aerodynamic chord.

The screen grabs at the top of the page show the CX-3's major functions. The Settings group is for device customizing, and the holding pattern utility is in the E6-B section, along with the weight and balance computer.

FAT AVIATION BRAIN

We can't come close to covering all of the CX-3's functions, but we'll touch on some that stand out—both basic and advanced.

As rudimentary as it may sound, some of the more useful features in the CX-3 are its timers and clocks. There are two timers, including a stopwatch and a countdown timer that you might use for switching fuel tanks or timing an approach segment. Heck, we think the timer and clock utilities are better than the ones on a Garmin D2 aviator watch. An internal clock runs even when the unit is powered off, and it can display local time, destination time and UTC.

As you would expect, the CX-3 is all about computing complex conversions, and there are 12 categories in all to include distance, speed, duration, temperature, pressure, volume, rate, weight, rate of climb/descent, angle of climb/descent, torque and angle. These 12 conversion categories contain 38 different conversion units for more than 100 functions.

With the FLT mode (E6-B func-

tions) it's easy to see why the CX-3 could be as useful in a knowledge exam as it is in the cockpit. The dedicated Conv Unit key is used to quickly convert items like gallons to pounds, knots to MPH and Celsius to Fahrenheit temperature. The FLT function handles pressure altitude and density altitude calculations.

As one example, say you plan to fly at 4500 feet indicated altitude and the current altimeter setting is 30.15. To figure out which pressure altitude you should use to calculate the true airspeed, press the FLT key, highlight the Altitude line and enter 4500. Then enter the 30.15 for the altimeter setting. The computer will spit out 4289 feet as the pressure altitude.

Need a fast density altitude conversion for an airport where you know the field elevation? Enter the indicated altitude, enter the baro setting and then enter the outside air temperature. The computer does the rest, displaying the pressure altitude and density altitude.

There's also a cloud base function, which computes the altitude of the cloud base after you key in the dew point and OAT at the airfield. For example, if you enter the surface temperature as 90 degrees and the dew point as 45 degrees, the CX-3 does the math, putting the clouds at 10,227 feet AGL.

Perhaps a favorite tool (also in the E6-B group) is the Holding Pattern utility. With limited data entry, it prompts with the recommended holding pattern entry. Say you're instructed to hold on a 270-degree radial while flying on a 160-degree heading. In the FLT menu, select Holding Pattern. Key in 160 for the heading and 270 for the holding radial. The display would show "Direct" as the entry procedure and 90 degrees as the inbound heading to fly.

On a side note, you can also

LONG LIVE THE WHIZ WHEEL

Long before electronic flight computers, tablet apps and GPS navigators made child's play out of on-the-fly aviation math, there was the E6-B, affectionately nicknamed the whiz wheel. There's some interesting history behind the device, and for aviation buffs it's worth a Google search. Developed in the 1930s by naval Lt. Philip Dalton, the E6-B name carries over from the original part number for the U.S. Army Air Corps. Over 400,000 E6-B's were manufactured during World War II and most were made of plastic that glowed under black light-illuminated fighter cockpits. My use of the whiz wheel is far less glamorous, but I remember demonstrating my proficiency with it during a checkride in a Cessna 150 in the mid-1980s. The same well-worn whiz wheel has a spot for life at the bottom of the flight bag.

If you've never used a whiz wheel, it has two main parts: a circular slide rule side for making quick airspeed and density altitude calculations (to name two), plus a wind side for computing groundspeed and wind correction

angle. The slide portion of the circular slide rule is packed with quick-reference data, including crosswind correction, or the angle between the wind direction and true course. You can also solve problems involving fuel consumption, fuel endurance and fuel capacity, plus time-speed-distance.

ASA currently sells no fewer than five different models of its AirClassics mechanical flight computer. The



\$34.95 flagship ASA-E6-B is a color version shown in the main photo below. It's the same whiz wheel ASA has sold for years, but enhanced with color markings for easier readability. Made of brushed aluminum, the wheel and slide-equipped computer measures just shy of 10 inches long and 5 inches wide. If that's too big to carry around (it comes with a storage pocket), the \$29.95 Micro-E6-B is 6 inches long and 3.5 inches wide. It has a high- and low-speed wind correction slide, plus all of the other functions found on the larger computer. There's also the \$12.95 paper model, which is made from solid heavyweight fiberboard.

ASA also sells the \$12.95 model E6-B High Speed Slide. This is a companion product for high-speed flight (220 to 700 knots) computations. It has a compressibility correction chart, worldwide time correction chart and an ICAO Standard Atmosphere reference table.

After using ASA's CX-3, it would be tough to go back to an old-school whiz wheel, but it's a money saver and more interesting than typing in the data.

source holding pattern guidance from a Garmin or Avidyne GPS navigator. In Garmin's GTN750, you can add a hold to any flight plan waypoint, specifying inbound or outbound course, direction of turns and time or distance legs. The navigator shows the entry on the moving map for when you cross the holding fix. The utility also exists in Garmin's G1000. For use in some flight simulators and real airplanes not so equipped, the CX-3's holding pattern is a useful tool.

If you're not up for figuring out wind correction angles on a traditional E6-B (see the sidebar above), the CX-3 has plenty of capability. The Wind Component utility computes the headwind or tailwind compo-

nent, plus the crosswind component for a given wind and runway. But you have to enter the data correctly—something we botched at first, followed by some head scratching.

Since the required data inputs are wind speed, wind direction and runway, you enter the runway number and not the runway's magnetic course. For example, type 24—not 240—for runway 24. For a crosswind component from the left, the computer displays a negative value. From the right, it's a positive value.

BELT, SUSPENDERS AND A LEARNING TOOL

Not every pilot needs the CX-3 computer, but we think plenty can benefit from its utility. Plus, the price is right. On the other hand, like you, we're well aware of the flight planning and E6-B functions that are built into popular navigation apps and even within the auxiliary menus of GPS navigators.

We'll look at those capabilities and see how different programs are

equipped in an upcoming series on tablet navigation apps.

ASA's Brian Snider understands the reality of the modern competition, but makes a good point when it comes to the device's utility as a learning tool.

"Using an electronic flight computer like the CX-3 helps students understand the relationship between the components and variables involved in an equation, the data that is needed to complete the equation and how to more accurately pinpoint the answer for a given test question or real-world situation," he said.

Of course, we think there is value in having all of that computing power in a standalone, separate device. The CX-3 doesn't rely on a Wi-Fi connection, isn't affected by program crashes and serves as a belt-and-suspender standby tool.

ASA covers the device with a five-year limited warranty, provides a protecting storage cover and a set of batteries and it is available from ASA directly, or from a variety of retailers.

CONTACT

Aviation Supplies & Academics (ASA)
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www.asa2fly.com

Budget ADS-B: uAvionix, Garmin Lead

For mandate-compliant ADS-B under \$3000 installed, the uAvionix skyBeacon and Garmin GDL82 make practical sense, but only with healthy transponders.

by Larry Anglisano

If you're still holding out for a cheaper mandate-compliant ADS-B upgrade, the calendar is closing in on you. We're hearing that the better avionics shops have sizable installation backlogs—some greater than six months—for even basic upgrades. Some are charging a premium for priority scheduling. We predicted this very scenario years ago, and suspect shop labor rates will increase, moving forward.

So since some buyers might actually pay more for installation because they waited too long, and with less than 23 months until the FAA's ADS-B mandate takes effect, we decided to

scan the dense market for the absolute lowest-cost solutions. We picked Garmin's now certified GDL82 and the uAvionix skyBeacon, both priced sub-\$2000, plus installation.

Since we know that low-cost equipment may not be the easiest to install, we looked hard at the installation process, required accessories and optional accessories. Read on for a technical and cost comparison of the two ADS-B systems that we think will serve the market's low-flying lower end.

TRANSPONDER FIRST

When the shop has the aircraft for the FAR-required two-year transponder certification, it's a good time to get a proposal for an ADS-B installation. Be prepared to talk technically and be able to answer whether you want a 978 UAT or 1090ES ADS-B transmitter. By now you know that if you plan to fly over 18,000 feet

The skyBeacon wingtip light in the main photo below beats the Garmin GDL82, inset image, for overall utility and ease of installation. But Garmin has an STC—the skyBeacon is pending.

you'll need a 1090ES transponder. Both of these are lower-flying UAT-based systems. Easy decision.

But it's not all about service ceiling. As we've advised in the past, if you've been nursing along a vintage transponder, now is the time for a two-shot upgrade with a 1090ES ADS-B transponder. We looked at them in the ADS-B Buyer's Guide article in the May 2017 *Aviation Consumer*. We'll refresh the guide for our May 2018 issue.

If you've fallen behind with the required FAR 91.413 two-year transponder certification, now is the time to get it done. Ask the shop doing the inspection if they think the transponder is healthy enough to survive long-term service.

It's also time to evaluate the existing transponder antenna system, including coaxial cabling. ADS-B systems interact heavily with the L-band transponder system and it has to work well.

The GDL82 and skyBeacon both have integral WAAS GPS, solving the high-dollar dilemma for aircraft that haven't seen a GPS upgrade. Neither system has ADS-B In capability, but uAvionix is working on an interesting companion product that does.

While low-budget solutions are generally ADS-B Out only, that isn't necessarily a bad way to cut costs. The market is rich with good performing portable receivers and even better tablet apps for playing the



data. Buyers likely already own a trusted portable receiver.

GARMIN GDL82

Announced at AirVenture last summer, the \$1795 GDL82 (includes antenna) has Garmin's signature smart engineering and even better, the simplest interconnect of any Garmin ADS-B product to date. The system is a remote transmitter that connects in-line between the existing transponder and the transponder antenna system. See the installation sidebar on page 14 for a pictorial. It's a practical interface that we wonder why it has taken years to develop.

The patent-pending system is certified via an STC with a flight manual supplement on a Mooney M20 series, and Garmin authorizes installers (via STC authorization letter) to use the STC as a basis for signing off the GDL82 installation. It used to be that even with this previously approved data, shops had to lobby for FAA field approval. But according to Garmin, as long as the install is performed according to the STC installation manual, it can be signed off as a minor alteration by either a Part 145 repair station or an A&P holding an IA (Inspection Authorization) certificate. Based on our research, this is in line with the FAA's March 2016 memorandum for guidance on the installation approvals for ADS-B Out systems. What does this mean for you? Less regulatory work for the installing shop means fewer labor dollars billed into the bottom line.

The GDL82 is a smart box in the sense that it synchronizes with the aircraft's transponder via 1030 MHz interrogations to obtain the transponder Mode 3/A squawk code,



That Cessna panel at the top is a poster child for a GDL82 or skyBeacon upgrade. It has a modern transponder, but no WAAS GPS. If your transponder needs major repairs, middle, we say price a transponder-based ADS-B solution. Shop testing, bottom, is the best way to determine the health of an existing transponder and whether you'll need to spend additional money on a new antenna system.



CHECKLIST



Garmin's GDL82 has a smart and easy-to-install interface with the existing transponder system.



The uAvionix skyBeacon is even easier, dropping into an existing nav light.



Keep waiting and you could be faced with scheduling backlogs and higher labor rates.

pressure altitude and Ident status. Garmin calls this Autosquawk and it's used on other Garmin ADS-B products. Autosquawk eliminates the need for a separate ADS-B control head, something required for some low-cost L3 and Freeflight ADS-B systems.

The GDL82 footprint is 3.39 inches wide, 1.48 inches high and 7.99 inches long, making it the right size for connecting in-line with the transponder antenna cable. The output goes directly to the transponder antenna. Since the device has a built-in WAAS GPS, it has input for an external GPS antenna, which is included with the system. It's important to note that the STC does not

provide data for the basis of airworthiness approval for the GPS antenna, but for unpressurized aircraft, this is easily signed off as a minor alteration.

It's possible to use an existing panel GPS navigator for inputting WAAS position to a version of the GDL82 that doesn't have a built-in GPS, although Garmin makes little if any mention of it in its marketing materials. That's because the GDL82 is really intended as a bare-bones ADS-B solution for minimally equipped aircraft. Plus, the effort it might take to run RS232 serial data wiring from the panel GPS to the GDL82 could eat up any cost savings.

WHAT MIGHT THESE REALLY COST?

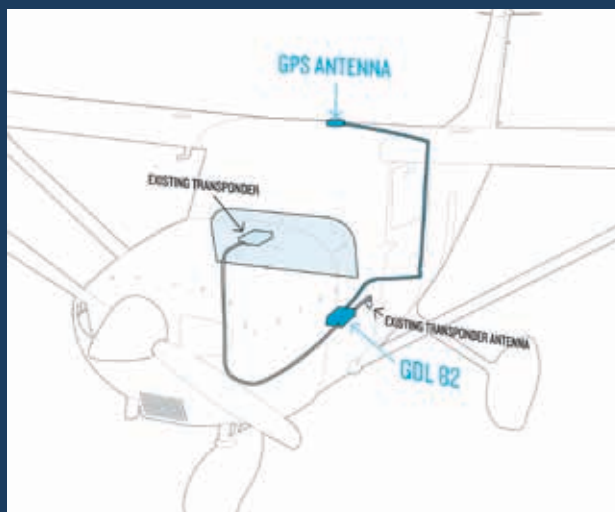
Installing the Garmin GDL82 seems to be the most straightforward of any traditional 978 UAT solution we've seen, but quick math proves that the invoice could snowball in a hurry. For basic airframes that don't require a lot of disassembly to access the transponder antenna system, it's not out of the question to finish the entire installation in one working shop day, although we think a day and a half is more realistic. At \$110 per hour, that puts the total best-case labor at \$990 for nine hours of work. It can go up from there.

The GDL82 is protected by the existing transponder circuit breaker, so in many cases a replacement breaker might not be required. If it is, add another \$100. For transponder antenna work—like replacing the coaxial cable, connectors and the antenna itself—add \$500, on average. That bumps the total labor and small parts to around \$1500, for the easiest projects.

If you want the ADS-B failure warning/status annunciator and anonymous mode switching, plan on paying for panel work to cut the holes, wire the lamps and switches, plus the cost of the accessories. Round numbers, plan on an additional \$300. There's also the option for connecting the system to a weight-on-wheels sensor to control air/ground status, but we think this will be rare given the entry-level nature of the GDL82.

A big installation variable will be the effort required to install the GDL82's antenna, either the GA35, GA36 or GA37. This requires removal (or at least partial removal) of the aircraft headliner or overhead panels, cutting a hole, mounting the antenna, sealing the antenna, running coaxial antenna cable from the GPS antenna to the GDL82 and then putting it back together. If you plan to use a compatible panel GPS, it will require accessing the GPS harness connectors and running RS232 wiring into the GDL82.

In the end (and for the lucky ones) the most basic fly-away total installed price could be as low as \$2800, and for others as high as \$4500 with options, including all parts and labor.



The uAvionix skyBeacon system comes with everything needed to complete the installation, including the hardware that bolts the device on and in place of an existing navigation light. uAvionix says you can use the existing lighting wires (power and ground) that run into the wingtip without having to route a new harness to the cockpit switch. Since the STC hasn't been finalized, there are some unknown requirements about whether the device will require a pullable circuit breaker or even a dedicated on/off switch to control the strobes.

Unlike the Garmin, the skyBeacon doesn't require a top-of-cabin WAAS GPS antenna because it is self-contained in the device, as is the L-Band antenna for the ADS-B transmissions. As for the strobe light interface, we like the concept of controlling the lights via tablet app. Best case, aircraft that don't have strobes installed won't need a lot of wiring, or a dedicated control switch. Again, the final STC will define the requirements. Still, if uAvionix holds to its target price, we think a skyBeacon install might easily fly away for \$2200—tops.

There's only a \$50 delta between the two systems.

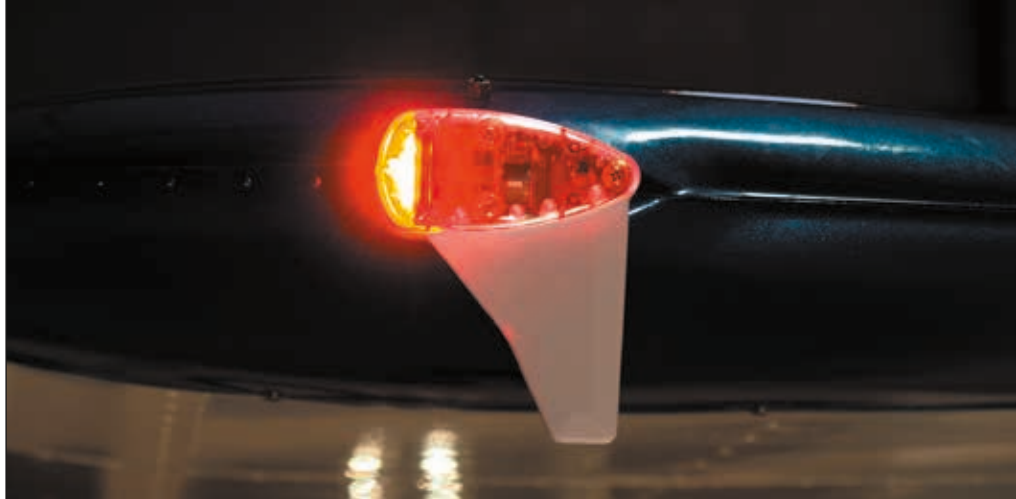
Still, compatible navigators include the GNS530W/430W units with version 5.30 or later software, GTN700/600 navigators with software 6.41 or later and the CNX80/GNS480 with software version 2.4 or later.

The way we see it, money may be better spent on upgrading the transponder antenna system, or even the transponder itself. Ask your shop if the existing transponder antenna is worth keeping. For the best performance, we favor fiberglass blade-style L-Band antennas over the rod and ball style. You might have to spend more money to upgrade an older system.

The installation manual advises replacing the transponder cable/connectors with MIL-C-17 type F low-loss cabling because it might be required to pass the transponder ramp check in accordance with Part 43, appendix F performance criteria. Shortchanging the installation could mean limiting the service ceiling of the aircraft.

The STC warns that while an existing transponder is a Class A (that is, with an operational ceiling greater than 15,000 feet), a degraded antenna system could limit its service ceiling to Class B standards, good only below 15,000 feet. The limitation must be documented with a panel placard and logged in the flight manual.

Optional is a panel-mounted ADS-B Out failure annunciator, warning that the ADS-B transmissions are inoperative. There's also an anonymous mode switch, which allows the GDL82 to transmit a temporary address instead of the aircraft's assigned ICAO 24-bit address, when the Mode A/C transponder is squawking 1200. These optional accessories might add several hundred dollars or more to the installation. The install manual says they have to be installed in a panel location so that the pilot has an



unobstructed and undistorted view of the annunciator.

UAVIONIX SKYBEACON

We covered the skyBeacon in the December 2017 issue of *Aviation Consumer*, and the company has made some product announcements and updates since we went to press with the article.

To recap, the skyBeacon is a 978 UAT solution that's designed to mount to the aircraft's wingtip, using the mounting and wiring for an existing wingtip position light. The device has a built-in WAAS GPS receiver and antenna, plus a 40-candela intensity red LED position light.

The skyBeacon has transponder monitoring circuitry that's smart enough to keep the aircraft's transponder and ADS-B squawk codes and Ident status in sync without a separate ADS-B control head. Like the Garmin, this is a money saver.

While the skyBeacon is available for experimentals and LSAs now, uAvionix told us certification via an STC program is targeted for this spring. The certified version of the skyBeacon will have a forward LED navigation light and also include an LED anti-collision strobe lamp that can be activated and deactivated with an existing strobe light switch, or via a tablet app.

The company is planning to release a companion starboard configuration skyBeacon for ADS-B In, which will connect to common tablet apps for displaying weather and traffic. One limitation of the skyBeacon we evaluated is that it won't work as a drop-in replacement for wingtip lighting housed inside of a fairing. uAvionix told us to expect alternative mounting options by the time the system is certified.

As for pricing, uAvionix plans to stay aggressive. "We know how important it is to come in below the \$2000

ADS-B compliance plus an LED lighting upgrade give the patent-pending skyBeacon an advantage over the GDL82.

price point, including installation," Shane Woodson at uAvionix told us. The company maintains that a typical skyBeacon installation will be accomplished in an hour or less.

"This represents a far lower cost of ownership than other recent affordable solutions," Woodson said. He's likely referring to the GDL82, plus he's confident that the companion ADS-B In model will cost much less than the ADS-B Out version.

A DEFINITE COST BENEFIT

While we like the simplicity of Garmin's GDL82, you get what you get and that's only bare-bones ADS-B compliance. In our view, that gives the skyBeacon a clear advantage for some aircraft.

Given that certified LED nav lights can run, on average, \$900 to \$1200, the skyBeacon allows for both an easier installation plus ADS-B Out equipage for roughly \$1000 more than a simple LED wingtip light upgrade. There's also the benefit of reducing power draw from the 26 watts or more with dual strobes to roughly 10 watts on both wingtips, thus greatly reducing the strain on older charging systems.

But if the aircraft needs a transponder upgrade—and many older, entry-level aircraft do—we think a transponder-based ADS-B solution makes sense over either of these systems. Don't forget the altitude encoder.

We think Garmin's GDL82 has an advantage because it already has an STC. You'll have to wait until spring for the certified skyBeacon. For some, it will be worth it to get new lighting.

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IFR Training Courses: Sporty's, King, PIC Win

To get through the rating efficiently we recommend immersing yourself. We like Sporty's and King for ground school and PIC for accelerated flight training.

by Rick Durden

Thinking rating, toughest rating, necessary rating, unnecessary rating—all descriptions we've heard of the instrument rating. No matter what you call it, the instrument ticket is virtually essential if you wish to fly professionally or, in our opinion, get the most out of ownership of a GA airplane designed for traveling.

We wanted to find out what's available for instrument training following the FAA's switchover to the new Airman Certification Standards (ACS) last year and see if there's a "best way" to approach getting the instrument rating.

We reviewed internet-based and downloadable ground training courses and generally available flight training programs. The bottom line is that we liked all of the courses designed to get you through the written exam but felt that Sporty's and King edged out the others because of their presentation and content.

We like flight programs that provide an organized syllabus that makes extensive use of simulators

and—if the student hasn't passed the written—gets them ready for it before they've gone more than about halfway through the program. The Cessna Pilot Center instrument rating course—designed with input from King Schools—is a model we like.

We recommend that any pilot who wants to get the rating efficiently should be prepared to go at it intensely—flying a bare minimum of three days a week—otherwise too much is lost between lessons. We are advocates of total immersion training—that's how the military, airlines and type rating schools do it. Accordingly, we think the 10-day training course model is a good one and like the company that's been doing it for over 35 years, PIC.

WRITTEN TEST PREP

For pilots who prefer to take training for the instrument written exam at home, there are several good courses available. We surveyed what we felt were the most popular to see what they cost, how convenient they were

to use—do they require internet connection and whether they can be used on multiple devices—and how they approached getting a student ready for the written exam. Frankly, we prefer instrument written exam training courses that go well beyond training for the questions on the written—we think a well-educated, well-rounded instrument pilot is a safer pilot.

We note that the FAA quit publishing its full database of questions and answers to the writtens over 10 years ago. It now publishes sample questions quarterly. It constantly makes subtle changes to the questions and answers. We're unwilling to believe any claims that a test prep company has all of the questions in its database—although we know all of them work like crazy to be as up-to-date as possible.

The FAA's changeover to the ACS last year meant major changes to the written test questions. The test prep companies all assert that they've smoothly made the transition. We think that's true; however, if your prep course has questions on the ADF, it's out of date.

SHEPPARD AIR

We're starting with the Sheppard Air (www.sheppardair.com) test prep course because we like it and we don't like it. We don't like it because it unabashedly is designed just to train a pilot to pass the FAA written and that's it.

We like it because it only costs \$45 and we think that if you take the course in accordance with the detailed instructions, the odds are very good that you'll pass the written with a high score.

It's a course that you download onto your computer (PC or Mac) or tablet—but only one device. Once downloaded you do not have to have internet connectivity as you study.

Sheppard Air encourages the student to memorize the test questions, even going so far as to say that if a mathematical calculation is going to take more than 30 seconds the student should not bother doing it—just "learn the concept" and memorize the answer.

In our opinion, the course is well organized. The presentation is stark, with no frills. The student is directed to go through each subject area by

Screenshots of sample Sheppard Air, top left; Gleim, top right, and Dauntless, bottom right, presentations of their material.

first looking at the questions with only the correct answer displayed. There is an explanation box with a brief outline as to why the answer is correct. The Sheppard Air website is linked to a large library of FAA publications should the student desire to read the background material relied on by the FAA for its choice of a correct answer.

Once the student has completed the initial task, the next step is to go through all of the questions again and learn to recognize the correct answer.

Once the student has completed the process in all subject areas, Sheppard recommends taking not more than two practice exams. Once the student gets a score of at least 90 percent, Sheppard issues a completion certificate and strongly recommends that the student take the FAA written within 24 hours.

The course comes with a money-back guarantee if you don't get at least a 90 on the FAA written.

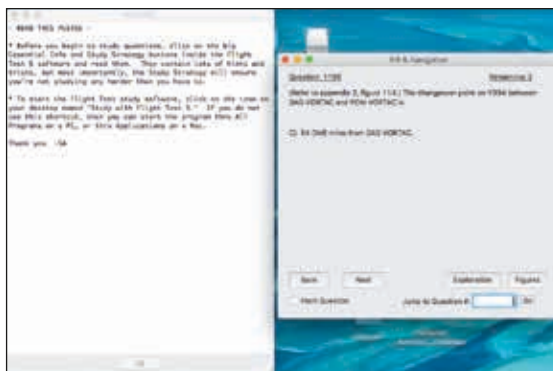
We like that Sheppard has a 24-hour-a-day help line staffed by instrument instructors that it repeatedly encourages customers to call.

GLEIM

One of the mainstays of the aviation education world, Gleim (www.gleimaviation.com) offers a number of online courses for a pilot working on the instrument rating ranging from a \$64.95 online written test prep through a \$99.95 instrument rating ground school and a combination of the two for \$149.95, through a \$209.95 deluxe instrument pilot kit. While it's beyond the scope of this article, Gleim also offers an instrument rating test prep book for \$24.95.

An online course purchase is good for 12 months. Consistent with its competitors, Gleim regularly updates the course during the year after you purchase it when Gleim learns of changes to the FAA written.

We looked at the instrument rating ground school rather than the test prep course because it is guaranteed.



Gleim's courses have always been focused, not flashy. The online ground school is no exception.

The course breaks the material into 11 study units with each further broken into subunits that can usually be digested in no more than 10 minutes. There is an optional 10-minute video for each of the 11 study units. While the student can go through the material in any order, we think that the best approach is to take it in the order presented because a section often builds on material from a previous section. Gleim indicates that the full course takes an average of 35 hours to complete.

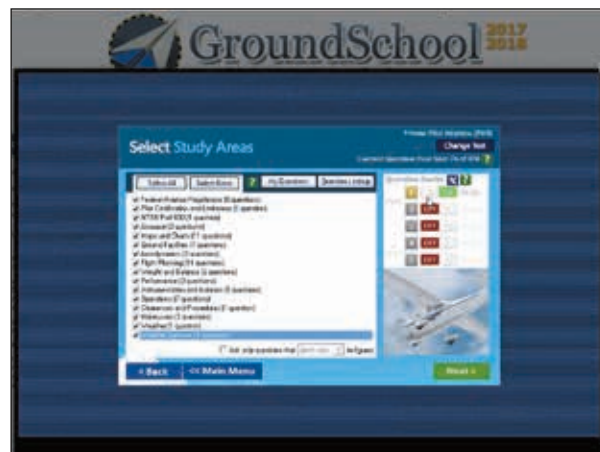
After going through a subunit the student is directed to a study session to take FAA questions pertaining to that subunit. When an answer is selected there is immediate feedback, in detail, as to why the answer is correct or not—and allows the student to click on a question mark for additional help.

We thought the clarity of FAA test figures and charts was excellent.

Upon successful completion of the required questions in a practice test the course generates a completion certificate that functions as an endorsement to take the FAA knowledge test.

DAUNTLESS

At \$48.99, the "GroundSchool" instrument rating test prep from Dauntless (www.dauntless-soft.com) may be downloaded to any one device—PC, Mac, Android or iPhone. It is a pure test prep program; however, the method of "learning by simulated testing" does not rely as much



on rote memorization as other pure test prep systems.

Dauntless points out that it feels that automaton pilots are not good pilots and that the FAA discourages rote memorization—it wants pilots who understand concepts—so it constantly makes subtle changes to test questions and answers.

Accordingly, Dauntless refers to its method of presenting test questions and answers as "active learning by doing" in that it helps the student understand the why of the material so they will not be fooled by subtle test question answers.

As with its competitors, Dauntless breaks the material, and FAA test questions, into sections. The student starts with seeing just the question and correct answer and works into progressively more demanding study levels—all the while having high-quality graphics and detailed explanations that support and explain the correct answer.

"Question stacks" are created through which questions related to an area in which a student has missed a question come up more frequently so the student can concentrate on weak areas.

The student can elect to display his or her progress and share it with her

INSTRUMENT TRAINING IN IMC? YES!

I've never felt it was appropriate that a pilot could obtain an instrument rating without flying in the clouds. From a safety standpoint—no matter what type of flying the pilot intends to undertake—it seems beyond ludicrous. I received instrument dual in IMC at a small airport in rural Iowa; one would think that it would be a basic part of the syllabus of every flight school or independent instructor.

It's not and it's not required by the FARs. However, the FARs are, by law, only minimum standards. I'm uncomfortable with the idea of flight schools and instructors only teaching to minimum standards and no more.

I think that some degree of seasoning should be provided to pilots who are obtaining ratings—so that they are not loosed on the aviation world capable of the monkey motion of steering the airplane, able to talk with ATC and quote regulations verbatim, but without experience in making the go/no-go weather decisions outside of hypothetical scenarios. In my opinion, because the FAA has disregarded its obligation to establish appropriate training requirements in IMC, flight schools and instructors have an ethical obligation to go beyond the FAA's standards for an instrument rating and take their instrument students into actual IMC on a regular basis.

Because of my profession (I've been an attorney involved with aircraft accident litigation for several decades), I've looked closely at far too many accidents that occurred in instrument conditions to pilots with instrument ratings but little actual time flying in clouds. We humans evolved on the surface of this planet and have only been creatures of the sky since we started flying balloons in 1783—evolutionally a flicker of an eyelash of time. A tremendous amount of what we experience in flight is without parallel to our experiences on the ground. Our inbred, ground-based instincts and

reactions get triggered by the sensations of flight, and unfortunately, they are often dead wrong when it comes to what is appropriate when moving about the sky. As a result, we have to learn nearly everything formally when we step into the third dimension. So, when first flying VFR, we go with flight instructors. I feel that when we first fly inside a cloud it's also a wise idea to do so with an instructor.

I want an experienced CFII in the right seat as safety net for a pilot's first foray into the clag, because the decision that pilots will be making means potentially looking death in the face, and I want the pilot alive. I don't think books and lessons and lectures and hangar flying fully prepare a pilot for the overwhelming desire to land that comes about when a runway is glimpsed, even if only momentarily. Such an urge, if not resisted, can lead to either foolishly continuing a descent while in a "little" cloud or, even worse, trying to circle over a runway and land on it when the vertical visibility is 500 feet, and the horizontal visibility is the same.

I've flown with instrument students when the weather was low enough to necessitate a real missed approach. New instrument pilots are primed for landing out of an approach—hey, it's the normal end to an approach. Well . . . not always, and that can be stunningly difficult for a pilot to accept.

A real missed approach usually causes distinct psychological reactions that, from my observations and reading accident reports, can't be duplicated in a simulator or under the hood. It takes an aircraft, clouds, uncertainty and cold sweat. I think it would be wise for an instructor to be there in case the left-seater falls off the tightrope.

In my opinion, an instrument student should demand dual in IMC. I also think CFIs and flight schools should be eager to provide it.

—Rick Durden

or his flight instructor. It's a free service; the student gives the instructor password-limited access to portions of the generated data.

We liked that the software can duplicate the appearance of the FAA written test questions as they appear at the various testing centers.

We like the Dauntless approach to teaching for the written test, but we were surprised by the absence of a money-back guarantee on the website.

ASA

Respected for its high-quality aviation textbooks, online courses and test prep materials, ASA (www.asa-2fly.com) offers an instrument pilot online course for \$199.95. For that you get 10 hours of video presentations, a digital textbook and ASA's Prepware that is designed to get a pilot ready for the written test. This is a full instrument rating course, although the \$49.95 Prepware can be purchased separately.

The online course may be accessed via PC, Mac, tablet or mobile device compatible with Apple and Android systems.

The course is structured so that the student reads the textbook chapters, views the applicable video and then accesses the Prepware. Once into Prepware, the FAA-style written questions are presented twice, once as a study session with feedback on each answer and then as a quiz that is timed and scored.

We've been impressed with the quality and content of ASA's books—this is no exception. The videos are not quite as good as those in more expensive courses.

Upon completion of the course and two practice tests with a score of at least 80 percent, ASA provides an endorsement for the written exam.

Purchase of the course gives 24-month access, so once the written is passed, it's an excellent reference for the checkride and beyond.

SPORTY'S

We were impressed by the \$199.95 instrument rating online course offered by Sporty's (www.sportys.com) for a lot of reasons. It was good when we looked at it several years ago, it's even better now and it offers a money-back guarantee that you'll pass the written.

The course can be accessed online, as an iPhone/iPad app or through the Apple TV app. There's no Android. It also allows your CFI to track your progress.

The course is via over 13 hours of videos that are some of the most professionally produced and content-rich we've seen. They go well beyond what's needed for the written toward making a well-rounded instrument pilot. Complex material is broken down in what we consider to be sensible fashions. The appropriate section of the ACS is referenced throughout the videos.

At the end of each video is a review quiz in FAA-question format and a direct link back to the relevant section of the video for each question. If you get stumped, you can click on "Ask a CFI" and get help.

Completing two practice tests with a score of at least 80 percent generates an endorsement for the written, which will appear in your ForeFlight logbook.

KING

The other big dog in the aviation training world, King Schools (www.kingschools.com) offers a series of instrument rating courses from checkride only, through written only, written and checkride to written and checkride as well as several pilot skills courses and various pilot gear. We looked at the \$279 Written Only course and came away impressed.

The course can be synced to any Apple device. Passing the written is guaranteed and the price allows unlimited lifetime access, unlimited access to FAA-style practice tests and automatic updates, something no other provider offers.

As with its competitors, the course is broken down into major subject areas. It gives a recommended flow through the areas. Clicking on a subject icon brings up the lesson groups, which are further broken down into lessons, usually three to six. Clicking on a lesson opens up the high-quality video, which lasts about 10 minutes.

Following the video, the first review question appears. Immediate feedback on the answer provided and a running report card is kept.

The entire library of review questions can be accessed at any time. King updates the course with "hot

sheets" flagged to alert students to changes. Completion of the course requires a score of at least 70 percent on three practice tests. Once that is accomplished an endorsement for the FAA written is generated.

OVER A WEEKEND

Most flight schools offer instrument rating ground schools on a regular basis. Most meet about once a week and use commercially available materials to train the students. The quality is all over the place and varies by school and instructor. We aren't going to try to make recommendations.

However, weekend ground schools for the instrument rating have been around as long as we can remember. They cater effectively to the pilot who knows her style of learning and it's not finding time to sit down in front of the computer every day to go through a course. He wants to step aside from the world for two days or so, be force-fed the material and pass the written.

We've done it and think it works for a lot of people, although not everyone. While we got the highest score we've ever gotten on a written after a weekend ground school, a friend couldn't absorb the material fast enough, failed the written twice and found that the best way was to sit down for some extensive one-on-one tutoring with a CFI.

Our survey showed prices from \$250 to \$450. The bottom line, in our opinion, is deciding to go to a weekend course, then get online and find out when one will be offered in your area. The price of the course is often secondary to the cost of your transportation, lodging and meals.

In our opinion, it is possible to prep for the instrument written in two days over a weekend, provided you take the exam immediately. The



Sample screenshots of, top to bottom, courses from Sporty's, King and ASA.

course isn't going to make you a well-rounded instrument pilot, but it will probably get you through the written successfully.

THE FLYING PART

Over years of taking dual, giving dual and interviewing pilots and flight instructors, we've learned what educators who have been collecting objective data on flight training have been saying is true—the most efficient method of getting a rating is



and usually does the ground and simulator training in the student's house.

To start the course (as with all such accelerated courses we checked) the student has to have passed the instrument written. PIC program director Tom Seymour told us that he also strongly recommends that the pilot be VFR current in the airplane to be used.

Following the PIC syllabus and proprietary course materials, the student goes through one-on-one ground school, training on a BATD simulator for at least all of the time that can be legally logged on the device toward the instrument rating, and flight time in the airplane arranged for by the student. PIC instructors give flight instruction in IMC, something we think is essential for any instrument flight training.

Pilots who have taken the course reported that they flew every day except when the weather was too bad—icing, thunderstorms and/or no viable weather alternates—or the airplane broke.

Our research indicated that most pilots who take the PIC 10-day course get through it in the time dedicated or in one or two more days. Where there were problems, we observed that it was because of weather, the airplane breaking, the pilot not devoting the time to the lessons and homework (a few hours each evening), there was a personality clash between the student and instructor or the student was simply not able to absorb the material fast enough—most often because she or he was over 60. Cost for the PIC

total immersion. That's why the military, airlines and type rating schools all follow the total immersion model.

IMMERSION WORKS

We've heard the claim that pilots who go the total immersion or "accelerated" training route don't really learn the material. They dump it like a bad load of software right after the checkride. The assertion is nonsense—there's no data to support it. What matters on the question of retention is continuing to use the new knowledge, skills and judgment after the checkride.

There are a number of ways a pilot can go the total immersion route for instrument flight training—coordinating it with a local flight school or CFII, traveling to a school that offers accelerated training or contracting with a school that sends an instructor to you.

Among the last, we like the model that Professional Instrument Courses (PIC) (www.iflyifr.com) has been honing since 1980—10, eight-hour training days and a checkride. In its program, the instructor comes to the student, flight simulator in hand,

We strongly recommend maxing out the allowable simulator time when training for the instrument rating, top. No matter what, there are going to be several hours of one-on-one tutoring, bottom.

program is \$6100 plus expenses for the instructor (travel, hotel, meals). If it takes additional time, there is additional cost.

We found that price to be similar to other 10-day instrument schools we surveyed—and some that promise the rating in seven days—although we express some skepticism on that timeline. Most of the schools send the instructor to you; some do the training at their facility or give you the option of their place or yours.

TAILORED IMMERSION

Most of the "accelerated" schools and courses have programs for pilots who have taken some instrument instruction and want to quit messing around and finish up. They should be willing to tailor the instruction to you—and take fewer than 10 days for the course.

Based on our research we have a number of recommendations for pilots considering an accelerated school:

- Make sure that you can schedule your checkride within a day or two of the completion of training, or that you can get a follow-up training session within a day or two prior to the checkride. When you complete your training, you're ready for the checkride. That readiness drops off fast. There is a major shortage of Designated Pilot Examiners (DPEs) right now; plan accordingly.

- Make sure the instructor will train in IMC—and take advantage of it.

- It's rare, but it's a fact of life as human beings—find out what can be done if you and the instructor just cannot work together.

- Make sure the airplane you are going to use is ready to go and that everything works—and that your favorite shop can fix small stuff that might break on very short notice.

continued on page 32

Sporty's Air Scan Radio: Bluetooth, Fair Price

The latest desktop aviation radio from Sporty's has a generous feature set, including Bluetooth for playing tunes from a smartphone. Receiver performance is mediocre.

by Larry Anglisano

There are lots of reasons for investing in an aviation-band desktop radio. Maybe you want to monitor local traffic communications while working in the hangar, listen to the local airport weather broadcasts over your morning coffee or listen to real-time PIREPs before launching. Plus, an aviation scanner can be a good learning tool for students.

So when Sporty's sent me its latest \$140 Air Scan radio/scanner to try, I was anxious to see how the receiver performed compared to the Icom A25N portable transceiver I reviewed in the January 2018 *Aviation Consumer*. To the test bench it went.

SIMPLE LOGIC, GOOD ERGOS

Sharing space on the bench with more expensive radios including my Grundig Field shortwave radio, the

Icom A25N portable and some older ham radio gear, the Air Scan has decent build quality for its price point, plus it couldn't be easier to operate. I particularly like the large rotary volume knob, which has a linear volume pot and a solid feel. There is plenty of volume via built-in speakers, and for use in large hangars or open spaces, the radio has an output for driving an external speaker.

Push and hold the red power button for two seconds to turn the radio on, and then select the source you want to listen to. For example, Air mode is for the 117.975 MHz to 137.000 MHz aviation frequency band. There's also AM and FM stations, but to my disappointment the radio doesn't receive NOAA Weather Radio station broadcasts. For household use, I think this would be a good utility—more so than the FM band.

CHECKLIST



Build quality is good, plus there are enough features for the \$140 price.



The set has a Bluetooth interface for connecting a smartphone. This turns the Air Scan into a stereo speaker system.



For off-airport use, plan on using a remote antenna.

To manually enter the radio frequency, simply key it in using the direct-entry numeric keypad. The current band in use is always displayed next to the tuned frequency.

The backlit LCD screen is bright, has large characters and is easy to read. If you botch a frequency during entry, the Clear key erases the digits entered and returns to the previous frequency.

To manually search through the frequency range of any of the bands, you can use the Up and Down button to step up or down in frequency. But perhaps more useful is automatically searching the entire band for a broadcast signal. Pressing and holding the Up or Down key for two seconds puts the radio in Scan mode. Once an active frequency is found, the radio freezes on it. You can press the Stop key to lock it in.

There's adequate frequency storage capacity (30 in all), including 10 air



The Air Scan has simple and high-quality user controls. Based on our trials, indoor performance is limited without an external antenna. Conveniently, the set uses a common BNC signal connector.



AIR SCAN RADIO AT A GLANCE



channels, 10 FM channels and 10 AM channels. To store a frequency, press the Preset key and hold the number button of the bank location you want the frequency stored. The radio beeps after three seconds, indicating that the frequency is stored. To recall the channel, select the Source button for the band it's in, press Preset and pluck the frequency from its memory bank. Overall, even advanced operation is refreshingly intuitive, compared to other radios in my collection.

PERFORMANCE, SPEAKER

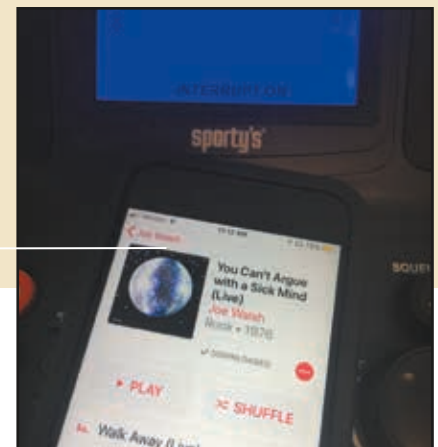
I evaluated the Air Scan at a time when I also had the Icom A25N handheld radio on the test bench, and it was worthwhile to make some comparisons between the two receivers.

It's important to understand that unlike the Icom, the Air Scan radio is not a transmitter—it's listen only. The Air Scan comes standard with a telescopic portable antenna that

connects to the radio with a twist-on BNC connector. Based on my observations—and depending on where you keep the radio—an external antenna will be a required accessory. I set up the Air Scan in my kitchen, which is roughly 10 miles from the airfield. With the antenna fully extended, the radio couldn't receive the airport ATIS broadcast even with squelch wide open. The Icom A25N, however, pulled it in easily without even cracking the squelch open. This was consistently the case with overflying aircraft while monitoring the local approach control frequencies.

I mentioned this to John Zimmerman, the VP of the Sporty's catalog division, who said that company is rolling out several external antenna options, including extension signal cables ranging from six feet to over 50 feet. On the airfield, the Air Scan receiver worked fine for receiving the ATIS and local traffic chatter.

What did impress me was the Air Scan's ability to double as a Bluetooth speaker. This gives it sizable utility when used in a hangar workspace or even around the house. Bluetooth



pairing is reliable (simply press the Bluetooth button and select Air Scan from the pairing list), plus audio quality is decent thanks to the set's stereo speakers. It didn't outperform my Bose Revolve Bluetooth speaker, but the audio quality is certainly acceptable when paired with a newer iPhone. I wish the Air Scan could display the current playlist info, but it only shows the Bluetooth is active.

And while you're jamming out, the Aviation Interrupt feature scans the aviation channels and interrupts the Bluetooth source if there's chatter. Interrupt is turned on or off with a dedicated key.

At \$139.95, I think the Air Scan is priced fairly, given its generous feature set, while the Bluetooth speaker function is a real bonus. I do wish it had a better receiver and I'll do a long-term follow-up after trying a remote antenna. Contact www.sportys.com.

You Tube See a video review of the Air Scan radio at <http://tinyurl.com/j95ht2a>

Cessna Control Yokes: Inspect The U-Joints Now

McFarlane Aviation's aftermarket universal joints used with a wide variety of Cessna control yokes require immediate inspection.

by Jim Cavanagh

The critical hardware that attaches an aircraft control yoke to the control surfaces should be inspected regularly, but if you own a Cessna, you might consider doing an immediate inspection.

That's because McFarlane Aviation in Baldwin, Kansas, recently issued a service bulletin for its FAA-PMA aftermarket universal joints that attach the control tube to the shaft for controlling the flight control surfaces in Cessna models. These are models ranging from the 120 to the 210.

While rolling out from a landing, a Cessna 170 experienced a lockup of its yoke and subsequent failure of the control tube/shaft U-joint. McFarlane Aviation's Dave McFarlane told us that his company developed its own FAA-approved U-joints a few years ago after quality problems (hydrogen embrittlement and play) with U-joints sourced from two different aerospace manufacturers. The McFarlane hardware is designed and fabricated using parts certified to MilSpec standards. These parts are made of a hardened stainless steel alloy, with the idea of reducing wear and corrosion, while increasing strength.

But the recent McFarlane service bulletin (SB-9) addresses a potential

failure of the company's part number MC0411257 universal joint. When it fails, the joint can separate. The event in the C-170 was preceded by the report of a late-model Cessna 172 experiencing stiff controls, and upon inspection it was determined that material contamination and lubrication had caused the problem. All affected articles were shipped between July 1, 2015, and September 30, 2016.

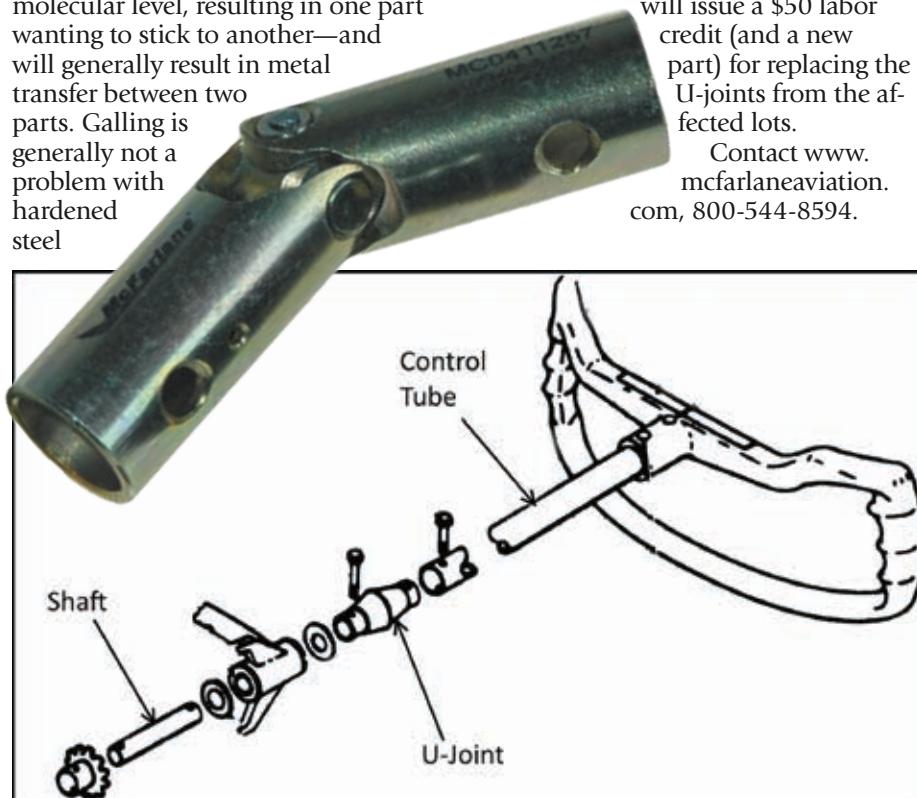
After the first report, the company revised the build materials and engineers determined that the like materials used in the part might have suffered from galling—an adhesive phenomenon that takes place at the molecular level, resulting in one part wanting to stick to another—and will generally result in metal transfer between two parts. Galling is generally not a problem with hardened steel

parts or in applications that have good lubrication.

The failed universal joints showed evidence of a perfect storm of contamination, lack of lubrication and metal transfer locking free movement of the joint parts. McFarlane nitrides the inner steel parts (similar to the hardened finish in engine cylinders), resulting in a slick, hard component that's impervious to contamination and has a molecular resistance to galling. There's a long-lasting, non-petroleum-based dry lubricant added to the petroleum-based lubricant. McFarlane completed the redesign by including a boot that covered the part, similar to the boot that Cessna used on some models in the past. Samples were subjected to rigorous testing, far beyond what could be expected out in the field, including tremendous torque loads, running dry of lubricant and cycling until they were too hot to touch. None experienced failure.

There are over 500 of the original-design universals in the field, and the service bulletin calls for inspecting and lubricating the part every 25 hours. The U-joint must be replaced within 100 flight hours after the initial inspection or one calendar year. U-joints that are yellow or gold in color are not affected and no further inspection is necessary. The company will issue a \$50 labor credit (and a new part) for replacing the U-joints from the affected lots.

Contact www.mcfarlaneaviation.com, 800-544-8594.



The easiest way to identify the component is by part number (and color), shown on the U-joint, inset image. That's a pictorial for Cessna applications in the main image. You can see how critical the U-joint is to control surface input.

Cessna 414:

The Cessna 414 Chancellor series gets high marks for its spacious dwelling, generous baggage space and favorable control response. Training is a must.



The last of the pressurized, piston, 400-series airplanes Cessna developed, pilots and mechanics will tell you that Cessna got it right with the models 414 and 414A.

Combining spacious cabins and relatively small, efficient engines, the 414 series can carry lots of fuel or a small crowd with their belongings—but not both. All told, Cessna built nearly 1000 of the airplanes—roughly a 50/50 split between early tip-tanked 414s and wet-wing 414A Chancellors—during 16 years of production. Once in service the airplanes became popular as workhorses for small charter and corporate flight departments, as well as comfortable transports for private owners.

Today, prices range from around \$120,000 to nearly \$300,000 for typically equipped 414s with mid-time engines. Operating and maintenance costs are attractive when compared with those of competing airplanes, such as the big-brother Cessna 421 and the Beech Duke.

In a study of accident records some years ago, the 414 stood out as the safest light twin. Of course, any airplane's safety depends a great

deal on the proficiency of its pilots—something you'll need to fly a 414.

There are several good training programs available to help keep 414 pilots in top form, something we feel to be quite important. While the accident rate is low, our recent wreck report research showed things can

The 414 shares the distinctive silky-smooth control response of the other 400-series Cessnas.

get ugly in amateur-flown 414s and involve deficient pilot skills while flying in IMC, rather than anything wrong with the airplane.

HISTORY

Cessna borrowed components from existing 400-series airplanes to come out in 1970 with a model to bridge the price gap between unpressurized and pressurized twins. It had basically the same tail and "wide-oval" fuselage as the 421B, and the 401's wing. The engines were adapted from those used on the 401 and 402 models—the differences were inter-

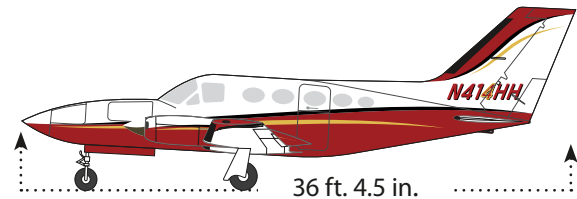
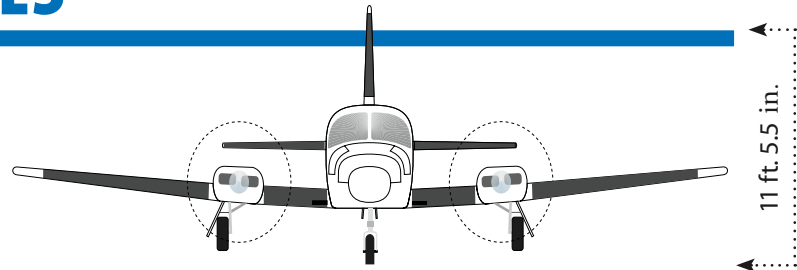
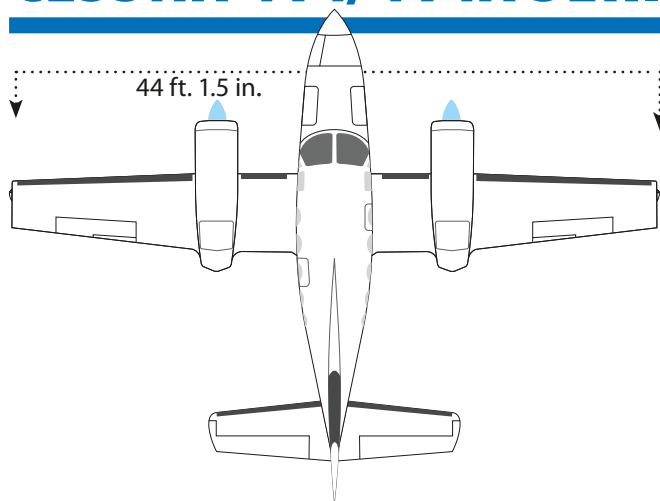
coolers and provisions for bleed-air cabin pressurization. List price was \$138,000 (that's over \$850,000 in 2017 dollars)—\$35,000 less than the Duke and some \$50,000 less than both the 421 and Piper's P-Navajo.

Engines were 310-HP Continental TSIO-520-J's, and propellers were three-blade McCauleys. According to Cessna, 4.2-PSI cabin pressure differential could be maintained by either engine operating at 60 percent power. Six seats were standard; a seventh was available as an option. Maximum takeoff weight was 6350 pounds; max landing, 6200 pounds.

In the years following its introduction, the airplane saw few major changes. One of the most important came in 1973, when cabin length was increased 16 inches and a fifth side window was installed. Elec-

Ted DuPuis sent the photo of a 1977 414 owned by Cloud Nine Rescue Flights. Like most 414 pilots, DuPuis reports that the airplane is easy to hand fly and stable on approaches.

CESSNA 414/414A SERIES

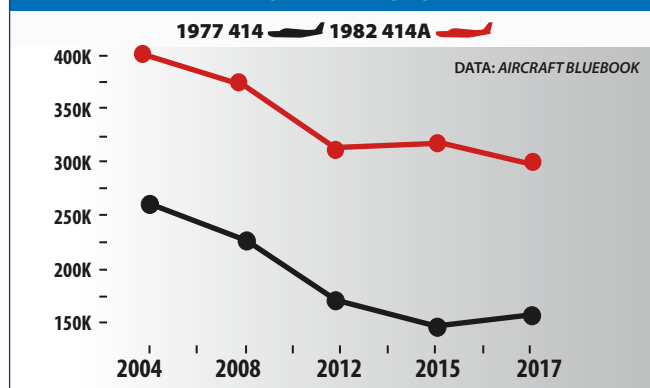


drawings courtesy www.schemedesigners.com

CESSNA 414/414A SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1970-1975 CESSNA 414	310-HP-CONT. TSIO-520-J	1400	\$40,000	102	900-1000 LBS	200 KTS	±\$120,000
1976-1977 CESSNA 414A	310-HP-CONT. TSIO-520-N	1400	\$40,000	102	900-1000 LBS	200 KTS	±\$155,000
1978 CESSNA 414A	310-HP-CONT. TSIO-520-N	1400	\$40,000	213	900-1000 LBS	200 KTS	±\$220,000
1979-1985 CESSNA 414A	310-HP-CONT. TSIO-520-NB	1400	\$40,000	213	900-1000 LBS	200 KTS	±\$275,000

RESALE VALUES

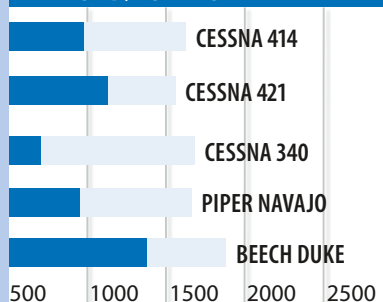


SELECT RECENT ADS

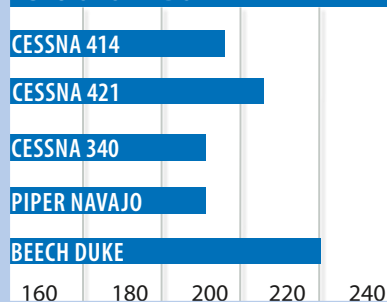
AD 2005-05-52	WING SPAR CRACKING INSPECTION
AD 2000-01-16	EXHAUST SYSTEM INSPECTION (CHECKLIST)
AD 1997-26-16	REPETITIVE INSPECTION ENGINE MOUNT BEAMS
AD 1990-03-13	MAIN LANDING GEAR BUSHINGS
AD 1986-13-4	CYLINDER CRACKING INSPECTION

SELECT LATE-MODEL COMPARISONS

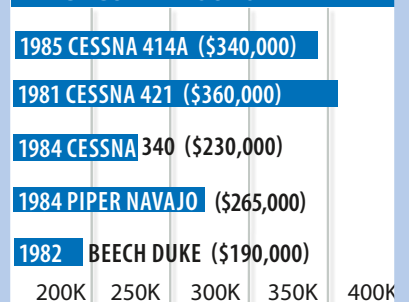
PAYLOAD/FULL FUEL



CRUISE SPEEDS



PRICE COMPARISONS





The top photo is a Chancellor with the original panel, but retrofitted with Garmin GNS navigators and S-TEC 55X autopilot. As is common in other 400-series Cessna twins, new custom flat panels with glass displays are possible, bottom.



tronic prop synchrophasers became standard equipment in 1976, when two versions of the airplane were put on the market: a bare-bones 414 and a 414II, which came with an assortment of ARC 400-series avionics equipment.

That year, most limiting and recommended airspeeds were boosted a few knots (except V_{mc} , which was lowered from 84 to 82 knots), and the -J engines were replaced with TSIO-520-N's. The difference is that an -N engine uses 38 inches of manifold pressure, rather than 36 inches, and 2700 RPM to produce its rated 310 horsepower. Standard usable fuel capacity of early 414s was 100 gallons

(50 in each tip tank). Optional auxiliary and locker tanks were available to boost usable capacity to 180 gallons, then to 203 gallons in 1973.

The fuel system in early 414s is complex, especially with wing locker tanks installed, and proper fuel management requires attention to detail. There are only two fuel-quantity indicators, both with three-position switches, to help the pilot keep track. The drill is to run the engines off the mains (tip tanks) for 90 minutes before switching to the auxiliary tanks.

This makes room in the mains because all return fuel and vapor from the engines is routed back to the mains rather than to the tank

selected. To get at the fuel in the wing locker tanks, it must first be transferred to the mains. Before doing so, however, the pilot has to ensure there are fewer than 20 gallons in each main (tip) tank. Fuel transferred too early is pumped overboard. The system left room for error, not only on the part of the pilot, but among line personnel. When told to "top off the mains," a line person may not realize that the mains are the tip tanks and will fuel only the aux tanks. Pay attention to the fuel system in tip-tanked 414s.

A simpler fuel system was among a host of improvements unveiled in 1978 with introduction of the Model 414A Chancellor. Tip, aux and locker tanks were obviated by a 4.5-foot longer, bonded wing holding 206 gallons of usable fuel in internal bays. Controls consisted of on/off/crossfeed valves and a fuel flow computer/indicator was added.

A 30-square-foot increase in wing area accommodated a 400-pound increase in maximum takeoff weight and a 550-pound increase in landing weight. A ramp weight of 6785 pounds was approved to allow for the consumption of six gallons of fuel during start, taxi and runup. Also, a zero-fuel weight of 6515 pounds was published to preclude excessive wing bending loads.

The 421's longer nose also was grafted onto the 414A, making space for an extra 410 pounds of baggage and avionics. All told, maximum useful load was boosted about 200 pounds and an eighth seat was added to the options list. Pressurization differential was increased to 5.0 PSI to enable the airplane to maintain cabin altitudes of 10,000 and 11,950 feet at cruising altitudes of 26,500 and 30,000 feet, respectively. (RVSM rules have generally limited 414s to 28,000 feet.) Limiting speed for the extension of 15 degrees of flap was

The 414 has a wide cabin with club seating, top. You don't have to look far to find bizjet-like amenities, bottom. This is one reason a 414 makes for a good charter airplane.

raised from 164 to 177 knots; V_{lo} and V_{le} were increased to an impressive 177 knots, from 143 knots.

Beginning in 1978, Cessna offered three basic equipment packages. In addition to the bare-bones model and the ARC 400-equipped 414AII, there was a III version with ARC 800- and 1000-series avionics, a Bendix RDR 160 weather radar and 100-amp alternators.

After the Chancellor debuted, there were few further refinements. One of the most important was the switch in 1979 to TSIO-520-NB engines, which have improved crankshafts. Four years later, Continental incorporated some changes to the -NB's cylinders, valve lifters and piston pins, and increased the engine's recommended TBO from 1400 to 1600 hours. Continental also published overhaul procedures to enable -NB engines to get the TBO boost.

Despite that, cylinder head cracking has been a persistent problem for the -N and -NB engines (as well as for other IO-, TSIO- and GTSIO-520s). An AD issued in 1986 requires cylinders to be pressure-checked for leaks every 50 hours until the engine has amassed 500 hours.

Four different pressurization systems were offered during the run of the 414A, so it's essential that the maintenance technician working on a pressurization glitch confirm which system by aircraft serial number.

PERFORMANCE, LOADING

Service ceilings are above 30,000 feet, but few owners fly that high. Most prefer the upper teens and lower 20s, where they get about 190 knots on 32 to 34 GPH at 65 percent power. A pilot in a hurry will see 205 knots on 38 GPH at 75 percent power rich of peak, although few operate that way anymore. With GAMInjectors and lean-of-peak operation owners report a reduction of about 3 GPH per engine at all power settings as well as cooler operating temperatures.

Single-engine performance at



sea level is average, about 240 FPM for the 414 and 290 FPM for the A model. At 11,350 feet, the 414's single-engine service ceiling was below average, but, at 19,850, the 414A is tops in its class.

Owner-pilots give high marks to cockpit room and layout of systems controls and enthuse about handling characteristics. The 414 and 414A share the distinctive silky-smooth control response of the other 400-series Cessnas. They are the Cadillacs of the piston line, with attention having been paid to detail; even on an airplane

of this vintage, only slight trim changes are needed when flaps or landing gear are reconfigured, although single-engine handling, as with any piston twin, is demanding and requires regular practice.

The big cabin, wider than it is tall, makes for comfortable seating and copious baggage space—the 414's forte. There's enough room in the aft cabin, the nose and wing lockers of a 414 to hold 930 pounds of baggage. With its bigger nose and lockers, the 414A can carry 1500 pounds. Loading must be watched carefully to avoid go-

CHANCELLOR ACCIDENTS: IMC EVENTS

When we reviewed the most recent 100 accidents involving Cessna 414s and 414As, we were struck by the absence of runway loss of control (RLOC) events—there were only two. Both were on runways contaminated with snow and ice. The Chancellor series apparently has extraordinarily good ground-handling characteristics.

On the other side of the coin, we were surprised at the number of crashes—most of which were fatal—tied in with flight in IMC or dark nights where there were no outside references. Twenty-four pilots got themselves into trouble doing everything from ignoring the MDA or DH on an instrument approach in foul weather and flying into the ground to trying to fly VFR into IMC—frequently in mountainous terrain—or simply being unable to control the airplane in the clag.

The 414 series is among the most IFR-capable of piston airplanes, but they require the loose nut on the control yoke to use a modicum of judgment when dealing with IMC. We were surprised at how often the pilot failed to do so.

In terms of things of concern to 414 owners, we think attention has to be paid to the landing gear and fuel systems. There were 10 events involving an inability to get all three of the Firestones into the wind and a gear-down-and-locked indication or in which one leg collapsed on rollout. All were due to improper maintenance or maintenance that was simply not performed.

The majority were on the 414, which has electromechanical gear that must be rigged per the book or will hang up. There were fewer failures of what we consider the better-designed hydraulic gear of the 414A, but it still requires actually performing maintenance.

We did see one example of the traditional bugaboo of the electro-mechanical twin Cessna gear: If the nosegear strut is completely deflated it's a no-go item. If the pilot

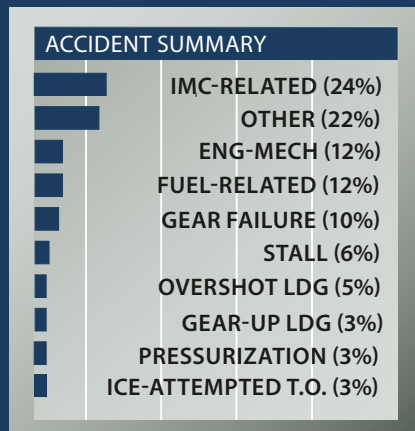
ignores it, it will jam upon retraction and will not extend.

We noted that one of the gear failure mishaps involved a nosegear trunnion that failed in fatigue. It had been on another airplane for 20,000 hours before being installed on the accident machine. "Hey, Boris, it looks just fine to me."

The 414 has what we consider to be a fuel system that isn't particularly complicated, it just has to be learned to make sure the pilot uses all of the fuel in what can be as many as six tanks. The 414A has a much simpler system, but the pilot still has to understand it to do things right. There were 12 fuel-related accidents, slightly fewer than we expected to see. They ran the usual gamut from total exhaustion to not selecting a tank with fuel in it to contamination not detected and removed before flight.

Three pilots attempted to take off with ice on the wings. None made it very far. It appeared to us that a majority of the stall-related accidents were also connected to an accumulation of airframe ice and attempting to maneuver at low altitude—such as during a circle-to-land approach.

Incredibly stupid pilot tricks led to two fatalities: one after a gear-up touch and go and one after the aircraft slammed onto its tail during loading, causing significant damage. The pilot took off, reported that the elevators were jammed and crashed trying to return.



ing out of the rear CG limit. The nose baggage compartment of the 414A made CG juggling easier.

With full tanks—enough fuel for nearly 4.5 hours with IFR reserves—a well-equipped Chancellor will have room left in its weight-and-balance envelope to accommodate six FAA-standard people with their toothbrushes. Load a six-person marketing staff with 800 pounds of equipment, and there will be room left for only about 1.5 hours of fuel.

It's important to note that a 414 is 7 knots slower than its little brother, the 340, which has the same engines and many of the same systems, but a notably smaller cabin. So, if it's just pressurization you're looking for and you're going to be flying with only another person or two aboard, you might want to look at the 340 for a personal hot rod.

However, a 414 appears to be a good choice for anyone who wants a pressurized airplane with a big cabin and lots of baggage space. Compared to its biggest competitors—the 421 and Duke—a 414 provides more room than the Duke, as much as the 421, travels a little slower, but does so more economically.

MAINTENANCE

Ensuring that all ADs have been complied with before buying a 414 will take work, because there have been several dozen of them (not counting a flurry of service bulletins), although the rate of issuance slowed down dramatically in the last 10 years.

The current concern is with wing spar cracking in high-time airplanes, with a series of ADs calling for inspections and modifications to the spar—compliance is expensive. One owner reported discovering mis-drilled holes in the spar of his airplane when it was opened up to install the spar strap: ADs 2005-05-52 and 2005-12-13 are current. (As of this writing there is an alternative method of compliance published by the FAA in CE-05-35.)

A potential buyer should carefully investigate the compliance status of the airplane by flight time and serial number, especially if the airplane is high time. The exhaust system sees a great deal of heat and vibration, thus components wear out. An ex-



Look at all of the available storage space in the 414, top photo. Aside from the cabin, there are wing lockers and plenty of room for bags in the nose.

haust leak is a critical item on a turbocharged airplane and can lead to a serious fire in flight. (See page 25 for an abbreviated AD list.)

We spoke with Michael Cook and Todd Voshell, who direct maintenance at Rapid Air, in Grand Rapids, Michigan, which has been operating 300- and 400-series Cessna twins for over 25 years. Both were quick to praise the 414 and especially the 414A as the best of the Cessna piston twins, with good systems, particularly the hydraulic gear on the 414A. They said that the Cessna inspection procedure manual for the airplane is one of the best such manuals written. If followed carefully, a mechanic won't miss anything. Areas to watch on the pressurization system are to make sure the nine drain seals are changed regularly as they deteriorate and become brittle and to regularly check the pressurization ducts off of the heater, forward of the forward pressure bulkhead, as they can develop major leaks.

The exhaust system AD must be followed carefully, including the 30-day checks whether the airplane flies or not. The gear system of the



414A is easy to maintain, with one spot to watch: When assembling the center bolt on the main landing gear scissors, the correct washers must be installed in the correct sequence or the bolt can pull out, allowing the main gear wheel to turn sideways.

Boost pumps seem to be a weak point, requiring what seems to be frequent replacement. The deice light on the panel illuminates only very briefly when the pneumatic deicing system is activated and only indicates that there's pressure to the tail boots. The switch for that light is on the underside of a T fitting in the pressure line to the tail and thus fills with water, rust and crud and should be pulled and cleaned periodically, or it will fail. It's an \$800 part.

MODS, TYPE CLUBS

Among the most popular mods are the RAM Aircraft Corporation engine swaps. Four variations are available, all of which offer a boost in useful load, increased TBOs and new props. The top of the line for

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Reader John Ewald moved from a Beech Baron 58 to a RAM VII 414A, shown at the top, before ultimately upgrading to a Cessna Conquest—a logical step up from a 414. That's a 414 retrofitted with PowerPac spoilers plus winglets, bottom.

the 414 is the series VI. In addition to 335-HP engines, new props and intercooler scoops, it includes a set of vortex generators and gives an increase in useful load of 415 pounds. Owners of 414As can opt for the series V conversion, which includes Continental's 350-HP liquid-cooled

Voyager engines, which have a TBO of 2000 hours. RAM also makes winglets and vortex generators. (See www.ramaircraft.com.)

VGs are also available from Micro Aerodynamics (www.microaero.com) and V/G Systems, phone 800-328-4629. By all accounts, vortex generators reduce V_{mc} and stall speeds. We highly recommend them. Micro Aerodynamics' VGs provide a 350-pound gross-weight increase.

Speedbrakes/spoilers are available from PowerPac Spoilers (www.powerpacspoilers.com) and more advanced intercoolers come from American Aviation (www.americanaviationinc.com). There's also the Speed Cover wheel mod from Premiere Aviation. In the November

2016 *Aviation Consumer*, we covered the Speed Covers in the speed mod roundup article after verifying the company's claims of a 5- to 10-percent reduction in fuel burn and a single-engine climb rate increase of 25 percent.

Premiere has an STC for the 402C, 414A and 421C. There's also approval for the Cessna 425 and 441 twin turbines. Contact the company at www.premiere-aviation.com.

In our view, the Twin Cessna Flyer club (www.twinessna.org) is the hands-down go-to type club for the 414. It offers extensive and excellent support for the airplane, in addition to all other twin Cessnas.

OWNER FEEDBACK

I moved up from a Beech Baron 58 (that I owned for nine years) to a 1981 RAM VII 414A with winglets, which I kept for three years and about 600 hours. To say the aircraft was maintenance intensive would be an understatement. It was almost a certainty that after a round-trip flight over 1000 miles it would require repairs of some kind, often an engine component.

Even though I had well-balanced GAMI fuel injectors, the engines would not run smoothly lean of peak. They always had a rumble, creating a noticeable vibration in the cabin. I understand this to be normal for the TSIO-520, but was not the case with the turbine-smooth IO-550 piston engines in the Baron.

Takeoff and climb performance was mediocre. Initial climb was roughly 1000 to 1200 FPM, decreasing to 300 to 500 FPM in the lower flight levels depending on temperature and weight. To help, winglets, strakes or Premiere Aviation's Speed Cover wheel mods are desirable.

Engine cooling during climb was problematic. It was necessary to switch the boost pumps to high and quickly pull the mixtures back to keep the engines from stumbling yet rich enough for cooling. I aimed for CHTs below 400 in climb and 380 in cruise. At altitude the aircraft was remarkably efficient. I would see 210 to 215 knots at FL210 on less than 32 GPH lean of peak with the aforementioned rumble. Cabin comfort was excellent.

During initial and recurrent training at SIMCOM I learned of the superior piloting skills required to manage



That's a Speed Cover wheel mod in the top photo. Installation can be accomplished in around two hours and the kit starts at around \$1500.

the aircraft after an engine failure at takeoff. Not to say it's impossible, but there was little excess thrust after loss of an engine.

Also, the cockpit of the airplane is extremely busy. I believe the 414 is the tip of the pyramid in complexity in general aviation aircraft.

The straw that broke the camel's back was an engine case crack. It was at this point I decided the airplane was unsuited for reliable business transportation.

I now own a Cessna 425 Conquest that is a much better airplane with similar costs of operation, even with its turbine engines.

John Ewald
New Braunfels, Texas

We operate N620CA, a 1977 414 that is owned by Cloud Nine Rescue Flights, a 501(c)3 nonprofit that I founded and am president of. We've owned the aircraft for approximately 20 months and put roughly 230 hours on it in that time frame.

We upgraded from a Colemill 310N and find the 414 to be a much more versatile aircraft. We burn in the low 30 GPH range combined for a solid 200-plus knots true airspeed at 18,000 to 20,000 feet.

The aircraft's sweet spot is in the low flight levels. Going up higher takes too long, the cabin altitude is too high and the engines just aren't

very happy. At FL190 there's a 7500-foot cabin, which is comfortable even for long days. Block fuel burns compared to the 310 are higher, but not tremendously so on a long trip.

Our 414 holds 203 gallons of fuel, which I consider to be essential if you want to make long trips non-stop. Making 1000-NM nonstop trips is routine for us in no-wind conditions (providing there is good weather). However, even 163 gallons of fuel will allow for a solid 600-NM block. Our mission involves a number of long legs, so we specifically sought out an aircraft that had over 203 gallons of fuel.

Although some tiptank-equipped birds have more complex systems than the 414A's, the system is not inherently difficult to manage once you understand it. The system is effectively the same as a 310, so those making the upgrade won't have any difficulties with the transition. An additional benefit of the tiptank 414 versus the 414A is that it is smaller in overall length and width, meaning it can more easily fit into hangars. Plus, the purchase price for a 414 is significantly lower than an equivalent 414A. For us, these benefits were important.

The best improvement we have made to the aircraft thus far is the MT four-blade propellers. I consider this to be the single best improvement I've made on any aircraft. The upgrade saved 27 pounds and we notice a 100- to 200-FPM improvement in climb rate, as well as a 6- to 10-KTAS improvement in the low flight levels, while also being noticeably quieter than the old propellers they replaced.

The 414 is a stately aircraft—not

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Instrument Training

(continued from page 20)

- Be up to date on VFR skills in the specific airplane and able to intercept and track a VOR radial and know how the VOR system works—it may be obsolescent, but it's on the checkride.

- Be willing and able to absolutely clear the decks for the entire training period—no business or family obligations or interruptions.

If you want to train at a local flight school, we recommend that it be at a school that has an organized syllabus (along the lines of the Cessna Pilot Center program) and has a simulator that meets the requirements for logging time for the instrument rating. We can't recommend simulator training highly enough—it lets you focus on specific tasks, do such things as multiple approaches in minimal time and it's much cheaper than doing the same thing in the airplane.

The school should be amenable to your schedule and willing and able to schedule you hot and heavy if you want to go at things without delay and with one, not multiple, CFIs.

CONCLUSION

We liked all of the internet-based ground training courses but lean toward Sporty's and King. For the flight portion of the instrument rating, we recommend that you do it with the minimum possible time between training sessions and that you seriously consider one of the 10-day programs—that's how the airlines and military do it and their pilots aren't too bad.

CESSNA 414

(continued from page 31)

the least bit sporty or nimble. It is not as fun to hand fly like a 310 is; however, it is easy to hand fly and very stable when shooting approaches. It's extremely comfortable for long trips. Our missions frequently are in the range of 10 hours of flight time in one day, and the cockpit leaves enough room to stretch on those trips so that it remains comfortable. There's lots of room for any portables, iPads or other items.

Many of the costs on the 414 are bipolar; either the big-dollar items need to be done or they don't. Being pressurized, new windows (especially windshields) will get into the low \$5000 range for parts and labor. Expect to pay in the low \$5000 range if you need an engine beam, which unfortunately is not uncommon, especially if the shop performing the exhaust AD has not done a good job of finding issues when they come up. We had to replace an engine beam that had been damaged by an exhaust leak.

As for the overall airframe itself, we have found it to be reliable thus far, but we also started out with one that had lower time and had primarily been a Part 135 and corporate-operated aircraft.

The RAM upgrades on the 414 are of tremendous value, if for no other reason than the useful load. Without a RAM upgrade (ours is stock), useful load on a 414 is not very generous, and requires careful planning to stay within weight and CG limits. Weight reduction at any possible opportunity

FEEDBACK WANTED

AVIAT HUSKY



It's time for a fresh look at the used Aviat Husky market in an upcoming Used Aircraft Guide in *Aviation Consumer*. We want to know what it's like to own these rugged backwoods taildraggers, how much they cost to operate, maintain and insure and what they're like to fly. If you'd like your Husky to appear in the magazine, send us any photographs (**full-size, high-resolution please**) you'd like to share to the email below. We welcome information on mods, operating expenses or any other comments that can be helpful for buyers considering a Husky. Send correspondence by March 15, 2018, to:

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is worthwhile on this aircraft regardless of RAM status. We have managed to remove over 150 pounds from the aircraft thus far, which is huge.

On a side note, if you receive feedback from any tiptank 414 owners on performance improvements they found by adding strakes, I would be interested in that. I have been considering this upgrade for our aircraft, but haven't found anyone with a tip tank 414 who can tell me about changes before and after. I hear generally mixed results regarding the performance aspect.

Ted DuPuis
Cloud Nine Rescue Flights
www.cloudninerescueflights.com