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Cirrus SR22T G5

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The Aviation Consumer

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The Engine Overhaul Crapshoot

Approaching the close of the last century, I owned a twin with a good friend. After flying it for some time, a costly AD plus the fact the engines were well past TBO meant it was time to send them out for overhaul. We sent them to a shop I thought was a good one and paid in advance for a one-month turnaround. We got them back six months later. They were junk. The FAA got involved and I found out the FAA has a criminal division. The owner of the overhaul shop spent a year in the federal slam for forging logbook entries on our, and other, engines.

We sent the engines out, again, to Blueprint Engines (sadly, since defunct) and G & N Aircraft (still alive and well in Griffith, Indiana). We were smart enough by then to only pay half up front. They came back on time and ran happily throughout our ownership of the airplane.

That episode taught me how fast an engine overhauler can go down the tubes. A friend had had an engine overhauled, without a problem, at that shop not a year before my debacle.

Over the last two years, I've had a ringside seat as another overhauler took full payment up front from owners and couldn't seem to get their engines done, in one example, for more than half a year. In at least one case, the owner had his disassembled engine packed up and shipped to another shop. He never received a refund, even though a refund was one of many promises made to him by the shop.

A few years ago, I became part owner of a Cessna 210. Eighteen months ago, it became overhaul time. The airplane had broken well over 1000 miles away. We paid Savvy Aircraft Maintenance Management's fee (full disclosure; I've done legal work for the company) to manage the engine overhaul. After discussion with Savvy, we selected Powermaster Engines in Tulsa, OK. Under Savvy's supervision, the engine was removed, shipped, overhauled to specs agreed to in consultation with Powermaster and Savvy, returned and reinstalled.

Everything went smoothly. About two months later, I flew to Oklahoma on business and went to Powermaster so they could do the first oil change and generally look things over. This was prior to me becoming editor of *Aviation Consumer.*

The oil change was accomplished, an issue with engine operation at idle was fixed and company owner Bill Cunningham flew with me to make sure everything was operating properly. There was no charge.

It may be a jaded perspective developed as an aviation attorney representing aircraft owners after things have gone badly wrong—nevertheless, I've come to feel that an engine overhaul is a crapshoot. Small businesses can go downhill fast if there is a blip in cash flow or if an essential employee departs.

I've formed the opinion that when it's time to overhaul, there are two rules of thumb after you've done all the homework into shops you can possibly do: never, ever, pay more than half the cost up front, and either have the work done at a shop that is close enough to go visit so you can see for yourself how things are progressing, or hire someone to manage and/or oversee the process.

Trust your gut—if the shop stops returning phone calls, asks for more money before the engine is done or you can't get hard information on what's happening, take action to get the engine out of there before it gets worse.

—Rick Durden

TN P210

Thank you for the article on the Turbonormalized P210 in the May issue. I had my P210 converted by Vitatoe Aviation in early 2012 and now have over 200 hours on the engine. I'm very pleased with the result—it performs as you described in the article: it's much faster at all altitudes, including cruising at over 200 knots above FL180; climbs to the flight levels in about half the time as before; and most importantly, does all this without cooling problems.

Engine management is much simpler than before and fuel consumption has dropped by about 3 GPH because I can reliably run lean of peak.

I found Larry Vitatoe to be a first-class person to do business with. From my first conversations with him prior to placing my order, through the conversion, the one-year warranty period and after it has expired, he has been pleasant, informative, helpful, honest and prompt. My two minor warranty claims (work performed elsewhere) were promptly paid with no questions.

His team delivered the airplane on schedule and within the estimate. Mine was about the tenth one done, so they were still learning—they have voluntarily supported my installation with changes based on what they learned after my installation.

Donald Fraser
Via email

iPad Mounts

In your article on iPad mounts in the June issue, you suggested that mounting an iPad on the copilot's yoke is OK so long as you don't mind looking at it at an angle.

My experience has been that using a fully articulating mount like RAM's allows me to mount it on the copilot yoke and turn the iPad so that it faces directly towards me. It works perfectly. I can see it clearly, it is easily within reach and it does not block my view of the panel.

Todd Rokita
Via email

Recurrent Training

It was good to see the article on recurrent training in the May 2013 *Aviation Consumer*, but I have to take exception with two items in the section on "Motion."

You stated that a simulator should be at least a "Flight training device (FTD) that meets FAR Part 61.57(c)(2) . . . and use for an IPC." This is misleading. On one end of the scale, both simpler aviation training devices (ATDs) and more regimented FTDs meet the requirements for logging approaches toward currency per 61.57(d), or table A1-2 in the back of the instrument PTS. To do an IPC, you'd need a Level-B, or higher, full flight simulator.

You also took a swipe at motion itself and cited an article as objective support. Your quote was out of context. The same study (really a metastudy looking at other studies on motion) points out that motion may have different values depending on the background and skills of the pilot. Motion as a distraction factor alone may have much more impact on the experience for a GA pilot compared to the professionals the source studies focused on.

Jeff Van West
Redbird Flight Simulators

Jeff Van West is a former editor of Aviation Consumer.

You left out FlightSafety International in your article on recurrent training. They are the most highly regarded and considered to be the most thorough of the simulator training companies. I attend the New York LaGuardia Learning Center twice a year for King Air training. They invariably cover all of the required items using scenarios that keep the training valuable, interesting and fun—plus they are extremely friendly.

FSI costs more than other vendors, but as an owner-pilot, I consider it money well spent due to the quality of the training.

Hamilton Potter
Via email

We did not include FlightSafety International in the article because it has dropped its simulator recurrent training for piston aircraft. A number of readers who were owners of piston-engine airplanes let us know that they were disappointed that they could no longer go to FSI for recurrent training.

A & P Recurrent Training

I disagree with your suggestion for recurrent training for A & Ps in the editorial in the June issue. Let's be careful what we wish for. Adding another burden and responsibility to our underpaid A & Ps will have to be passed on to customers.

Pat Malara
Via email

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AIRCRAFT FLIGHT TRIAL

Cirrus SR22T G5: Fast, Efficient Traveler

The fifth-generation SR22T offers an impressive combination of speed, utility and integration. We think it's the best Cirrus to roll off the line.

by Larry Anglisano

The fifth-generation Cirrus SR22 isn't an entirely fresh model. Instead, it's a compilation of advanced features and improvements that Cirrus has added to the aircraft over the past few years.

Whether it's the new paint and interior styling options, more advanced avionics that come standard, or the bold new gross weight increase, Cirrus' dedication to improving and advancing the product line proves why the SR22 has consistently outsold every other certified piston single. As we go to press, production order slots for the new SR22 G5 are sold out well into the fall of this year—encouraging in an otherwise declining aircraft sales environment.

We recently visited Cirrus headquarters in Duluth, Minnesota, plucked a new SR22T G5 turbo model from the flight line and hauled it halfway across the country—a mission the aircraft easily delivers with comfort, efficiency and utility.

CHECKLIST

- 3600-pound gross weight and seating for five expands the missions.
- Garmin Perspective integrated avionics offers huge automation.
- A decked-out SR22T flirts with an eye-popping $750-grand selling price.

NEW FIGHTING WEIGHT

Part of the aircraft's utility is courtesy of a new 3600-pound gross weight, up from a previous 3400 pounds. The new weight increase means you can load a SR22T commonly equipped with air conditioning, certified de-ice package, full fuel (92 gallons usable) and three 180-pound occupants. The weight increase also allows you to load more of your stuff—or another small passenger—into the previously-introduced 60/40 rear seat.

With the 40 portion of the rear seat folded down, we loaded a few full-size golf bags, luggage, flight bags and some other space and weight-eating gear with ease. The rear baggage area can accommodate 130 pounds of whatever you can

With a dynamic, two-tone paint scheme and optional carbon package, above, the SR22T G5 has more ramp appeal than ever before. The three-blade composite Hartzell propeller and carbon-fiber spinner sheds 14 pounds from the nose.

The SR22 G5 cockpit offers a near-perfect combination of advanced integration and ergonomics. Garmin Perspective G1000 avionics, top, is available in 12-inch screens. A flight management system with keyboard controller, GFC700 autopilot controller and new GMA350 audio control system are within fingertip reach from the pilot and copilot positions. 1600-PSI oxygen supply and environmental system, lower right, keeps the cabin and occupants comfy.

stuff in. To be sure, this overall utility is unmatched by few if any other four-place singles.

Increasing the gross weight a full 200 pounds required serious amounts of challenging, drawing-board engineering. But it also brought about some much needed operational benefits, including new airframe and flap testing that ultimately improved wing flap operating speeds.

If you've ever flown previous generation SR22s, you're familiar with the challenges of slowing the aircraft to the 119-knot initial flap extension speed. But the G5 changes that for the better—with a new 50-percent initial flap extension speed of 150 knots. The last notch of flaps comes down at 110 knots—an increase from a previous 104 knots. The payoff keeps getting better, since there is an extra 3.5 degrees of flap extension, for lower landing speeds. Many pilots have hammered Cirrus for not installing speed brakes on the slippery airframe, but the new flap configuration should keep most pilots happy.

To accommodate the new gross weight increase, Cirrus beefed up the main spar, strengthened the landing gear and added extra layers of composites to the airframe. But strengthening the airplane also meant shaving some structural weight wherever possible—a problem not solved with the CAPS (Cirrus Airframe Parachute System).

To make the airframe touch down at similar impact forces as previously certified, the size of the parachute had to be increased from 55 feet to 65 feet in diameter—requiring a larger and more powerful rocket to fire the heavier parachute. To save some space, Cirrus designed a more compact and modern ignition system that's fired via redundant electronic circuits. Pull the CAPS handle and the circuit closes, igniting the rocket. You can now pull that handle at 140 knots, increased from an old 133-knot deployment speed. The whole-airplane parachutes are still provided by BRS (Ballistic Recovery Systems) and require a mandatory 10-year repack interval.

ERGONOMIC INTEGRATION

Slide into the cockpit of the new SR22T and you're greeted by one of the most integrated flight decks found in a single-engine piston aircraft. If you're coming from an earlier-gen Cirrus with Avidyne Entegra and GNS430 package, the new Garmin Perspective cockpit will be like flying an entirely different aircraft. More on that in a bit.

Cirrus shaved some weight from the interior materials but the fit, finish and creature comforts have never been better, in our view. It's also a quiet cabin with limited amounts of engine vibe and plenty of personal space for crew and rear-seaters alike.

Cirrus nailed the ergonomics and

Beauty and utility. We loaded several full-sized golf bags through the baggage door and into the 40 portion of the 60/40 rear fold-down seats. This left plenty of room for our passenger to stretch out, top. The cockpit is a spacious dwelling that feels like a high-end sport coupe and has airbag seatbelts, middle. The TKS-certified flight-into-known-icing (FIKI) system includes additional coverage on the vertical tail, windshield nozzles, plus advanced onscreen monitoring of the system's status, bottom.

much of that has to do with the Garmin Perspective avionics suite—which now includes the integrated GFC700 autopilot as standard and EVS infrared camera as optional.

There's also the new GMA350 audio control system that excels at delivering high-end comm radio performance, while also distributing the SIRIUS/XM radio to each seat on the intercom.

The Perspective avionics comes standard with 10-inch PFD and MFD screens but according to Cirrus, most buyers opt for the optional 12-inch displays. The big PFD makes hand flying instruments a no-brainer, with Garmin's SVT highway-in-the-sky synthetic vision. As long as you keep the flight path marker within the magenta-colored boxes, you're on course. There are also old-school flight director command bars, but the highway-in-the-sky video-game-like guidance dominates. This is the drill when the GFC700 integrated autopilot isn't doing the flying. And flying it does. Simply put, if you aren't the type for programming the airplane to fly where you—or ATC—wants it to fly, then this isn't the airplane for you. Whether it's a climb or descent to altitude at a specified airspeed or a fully coupled precision GPS approach to the runway threshold, the GFC700 flight control system can get you there if you know how to program it.

While you're managing the automation, the Cirrus gets you there in comfort, with automotive-style environmental controls—with three-speed fan, recirculating and defroster modes—and excellent air conditioning and heater performance.

EASY PERFORMANCE

The SR22T is powered by the 315-HP Continental TSIO-550-K twin turbocharged engine. Every piece of engine data is monitored on the MFD screen (with critical data also displayed on the PFD). Gone are the mechanical fuel quantity gauges that used to live next to the fuel selector between the two seats. Instead, new fuel-level senders with electronic fuel quantity data is displayed on-screen, providing far more precision than most mechanical fuel gauges. The system helps keep fuel balanced between the left and right tank, periodically reminding the pilot to switch tanks with onscreen CAS alert messaging and warnings.

In many ways, operating the turbo SR22 is easier than the normally aspirated model, thanks to simplified leaning and power management.

Departing Duluth's Runway 27, it was a simultaneous application of full power and a lot of right rudder as the TSIO-550 spools to 36 inches of manifold pressure and 2500 RPM. As with all Cirrus models, the propeller governor is set in a fixed position, requiring no prop control.

Max weight liftoff speeds—and subsequent ground run—have increased from a previous 72 knots to a new 80 knots, requiring 1239 feet of ground roll. The stall speed is up from a previous 58 knots to 60 knots.

The 80-knot rotation speed comes quickly and if you're holding some back pressure to keep the weight off the castering nose wheel, the airplane effortlessly jumps off the runway. Through 90 knots it's flaps up (from the 50 percent takeoff position) and establish a 120-knot cruise climb.

Rich-of-peak climb is a simple full-power affair and lean of peak is equally as easy, especially with the Perspective Lean Assist mode, which is standard on the normally aspirated model. When the ASSIST soft key is pressed, the system initially

highlights the number and places a light blue box around the EGT readout of the cylinder with the hottest EGT. The system continues to detect peak EGTs for each cylinder lean of peak as the fuel flow is decreased, and the peak of each cylinder's EGT is indicated by a light blue marker on the graph. Once all cylinders are lean of peak, the last cylinder to peak is denoted by the "Last" annunciation below its bar on the graph.

Leaning the turbocharged engine is about as simple as it gets. Pull back to 30.5 inches and lean to the cyan-colored line on the fuel flow indicator. We saw every bit of 900 FPM in a lean of peak climb. It was a cold day, and the CHTs remained well below the 420- degree range noted in the POH. In a full-power climb, the POH says you'll see 1200 FPM, which we confirmed before pulling the power back.

The SR22T is certified to 25,000 feet, where it cruises at 213 knots true. After one brief level off, we climbed directly to 19,000 feet—where time-to-climb was approximately 40 minutes. Burning 17 GPH, the aircraft settled into 195 knots true, which is right out of the book. At one point, the airspeed indicator flirted with 200 knots true at that same fuel flow.

The aircraft has an integrated and graphical enroute fuel planning feature. The dotted green rings on the moving map display indicate the available fuel range—at the current power setting—with one hour of fuel remaining.

A solid green ring shows where the aircraft will be out of fuel. The endurance ring shrinks—or expands—as you richen or lean the mixture. There's just no excuse for running out of fuel in these aircraft, given this level of fuel planning integration and simplified fuel management.

Ultimately, we flew from Duluth to Hartford, Connecticut, non-stop in four hours—landing with close to one hour of fuel remaining, a comfortable reserve.

NEW APPROACH TO CIRRUS TRAINING

Despite the sophisticated and safety-enhancing systems that Cirrus builds into the product, the aircraft's safety record is disappointing. According to Cirrus training leaders I spoke with, there are several key problems that consistently get some Cirrus pilots into trouble. Landing and go-around mishaps are one of them—when Cirrus pilots simply do a lousy job of managing speed and botched landings.

Where the same pilot might get away with sloppy speed control in aircraft with low wing loading, a Cirrus is far less forgiving. Given the power of the big engine, torque rolls on the go-around is one ugly scenario, as is runway overruns on shorter landing strips.

According to Cirrus factory instructors and contrary to belief, the aircraft doesn't land well in a flat configuration. Instead, full-stall landings are preferred and good landings are easily achieved with proper speed control.

Moreover, these same instructors believe that field training is breaking down. While Cirrus doesn't exactly believe in creating a type rating for their aircraft, they do advocate type-specific training by type-specific instructors. That's the focus of Cirrus Approach, a new training initiative that Cirrus is taking worldwide, in hopes of bettering the safety record of their aircraft.

Refocusing efforts to enhance instructional quality in the field is a primary starting point for Cirrus Approach. This includes better training when it comes to using CAPS, the whole-aircraft parachute. Rob Haig, Director of Cirrus Flight Ops, thinks the CAPS should be pulled more often.

"We believe a lack of training and practice are the primary reasons pilots do not use CAPS when they should. In most primary training programs, pilots learn to fly in an airplane that doesn't have a parachute. The pilot is trained to keep flying the airplane in all emergency situations," said Haig.

I learned that first hand when I flew the company's Frasca TruVision simulator. Although I knew my first sim session would include a CAPS pull, I continued to fly a dead aircraft for nearly 20 seconds. My sim instructor noted that this was 20 seconds too long. "Our new approach to CAPS training is designed to fix this, and the misconception that Cirrus pilots are pull-happy."

WANT ONE?

Despite the sobering asking price, Cirrus delivers a lot of airplane to buyers with qualifying bank accounts. The starting price of the base SR22T G5 is $569,900, which includes XM datalink weather and entertainment, ADS-B transponder, electronic charts and SVT synthetic vision. Add popular options like dual 12-inch Perspective displays, certified icing protection, traffic alerting and air conditioning, and the price soars to around $700,000.

Cirrus offers the Xi Individualized exterior and interior design options, to add a personal touch to your SR22 interior patterns and paint work, for example. Gone are the days of the cookie-cutter Cirrus—where all airplanes looked alike. These days, Cirrus custom paint work sets a new standard for ramp appeal.

Cirrus also offers the Vision Inspired package, with tri-color paint work and other swagger that recognizes the Vision Jet that's currently in development. Buy one of these special SR22 models and you're recognized as a special member of the Cirrus family—earning a discount on a Vision Jet order slot—a project we're watching closely.

Winslow's Island Flyer series rafts include exterior and interior ladders to assist boarding, ballast bags and automatically inflating canopy.

Life Rafts

Select for stability, redundant flotation, ease of boarding and canopy. Though more expensive, Winslow is our pick for the best overall.

by Doug Ritter

It's been over a decade since we last looked at aviation life rafts. While there have been noteworthy changes in the industry, numerous evolutionary improvements and some new offerings, it's also a case of the more things change, the more they stay the same. Winslow still, in our opinion, offers the best rafts—you pay a premium, but we feel you get the value for your dollars.

In this article, we'll focus on the most commonly available two- to six-person life rafts from EAM Worldwide (EAM), Revere Supply Co. (Revere), Survival Products and Winslow LifeRaft Co. (Winslow).

With a few exceptions, these life rafts are not certified in accordance with FAA TSO-C70a (we call them "non-approved") and are generally significantly less expensive and often weigh considerably less than approved life rafts.

LIFE RAFTS 101

As a starting point, let's review what you should be looking for in your self-inflating emergency yacht. Some features we feel are desirable in any life raft, others are less important if flying to a Caribbean island versus crossing the Atlantic or Pacific oceans or overflying cold water. Due to length restrictions, we will just cover the high points.

The basic performance requirements for a life raft are pretty simple. It must inflate reliably and quickly, allowing survivors to get out of the water. Beyond that, it should ensure that they don't end up back in the water and provide protection from the harsh environment in which survivors may find themselves.

TUBES? CHAMBERS?

The simplest life rafts are little more than a single-cell (chamber) self-inflating, single-buoyancy tube with a floor. Visualize a kiddy pool. They are adequate to get survivors out of the water, but provide little of the other features a survivor may find useful or, sometimes, vital. Examples of this style life raft are the Survival Products 4-Man Basic (12 pounds), Revere Aero Compact 4-person (15 pounds), EAM-5 4-5-person (20.5 pounds) and Winslow 4-Person RescueRaft (16 pounds). You can add a modestly equipped Survival Equipment Pack (SEP) and a manually erected minimalist canopy (except for the RescuRaft) for a modest increase in weight and cost.

If a single-cell life raft is punctured, there's no redundancy—you're back in the water. Redundancy can be provided by either dividing a single buoyancy tube into two independent buoyancy chambers or by having two independent buoyancy tubes, one stacked on top of the

CHECKLIST

- ✚ Boarding can be difficult. Exterior and interior ladders are valuable.
- ✚ Adequate ballast is critical to resist capsizing and to assist boarding.
- ⛔ A hanging strap as the boarding aid seriously compromises a raft.

EAM's T4S, center, showing exterior and interior boarding ladders, ballast bags and automatically inflating canopy. EAM's hanging strap entry T4, lower left, has one tube and two cells. Revere's Aero Compact 45-AC4V-K3, lower right, with hanging strap entry and manual canopy.

other. Another source of redundancy is an inflatable floor, but this must be manually inflated (except for in EAM's higher end life rafts).

Dual-chamber GA life rafts such as the Winslow RescueRaft2 and Island Flyer, Revere Aero Elite and EAM's approved T4S and twin-cell single-tube classic life rafts such as the T4 have bulkheads in the tube to provide a degree of redundancy. If one chamber deflates, you are left with half the tube inflated, like a donut broken in half, or in the case of the square Revere Elite, with an L-shaped section of tube inflated, open to the water. That provides some degree of redundant flotation, but won't likely keep survivors out of the water. An inflatable floor mitigates this issue to a great extent.

If a buoyancy tube on a double-tube life raft deflates, survivors are still out of the water, albeit with minimal freeboard.

STABILITY

Stability—resistance to overturning—is a major concern. Beyond the weight of survivors in the life raft, two means are commonly provided to resist overturning, a sea anchor and ballast. Ballast is the more effective stability aid and another area where there are substantial differences among life rafts.

Ballast is typically a bag or bags suspended below the life raft that fill(s) with water. As a life raft starts to lift off the water surface in reaction to waves or if wind gets under the life raft floor, the weight of the water in the bag(s) counteracts the overturning moment.

The size, shape, number and location of the bag(s) determine how effective the ballast is in preventing a capsize. In addition, to prevent capsizing during boarding, how quickly the bag(s) fill with water after inflation of the life raft is important. When a life raft is not fully occupied—for example, only one or two persons in a four- or six-person raft—ballast becomes critical.

Survival Products' non-approved single-tube life rafts, EAM's classic line, unapproved and approved, and Winslow's RescueRaft have no ballast, though the latter can be fitted with optional ballast bags for $48 each (we recommend at least three). Survival Products' approved life rafts and its six-person double-tube non-approved life raft are equipped with a single ballast bag in the center of the life raft. Revere Supply's Aero Compact has a pair of ballast bags. Beyond that, the more fully equipped life rafts from all manufacturers have at least three and up to five ballast bags around the periphery of the life raft.

We consider adequate ballast to be critical for any life raft likely to be used in the open ocean, the Great Lakes and in moderate or severe weather.

BOARDING

Over the years, we have tested a lot of life rafts in swimming pools and open water. We've learned the hard way that without adequate entry aids, getting into a life raft from the water can be nigh on impossible for some—particularly anyone who is considerably overweight or for females who often lack upper body strength. A larger diameter buoyancy tube or double tubes that provide more freeboard, desirable in most circumstances, also increase the difficulty of getting into the life raft. This is exacerbated when cold water is involved, as grip strength and energy are compromised.

Based on our experience and testing, entry aids are a major issue to consider in raft selection. A life raft with only the most basic entry aid—a single hanging webbing strap—is seriously compromised, in our opinion. That would include the Revere Aero Compact, Survival Products' entire line and EAM's conventional life rafts. We do not recommend them.

The next step up is just that, a ladder of some type, typically made of webbing. It needs to hang low enough to be easy to reach the first rung and to have at least one additional rung. The Revere Aero Elite and EAM's T4S and T4AS have two-rung ladders. Winslow's boarding ladders are probably the best entry aid, having three or four rungs.

The addition of an inside boarding ladder makes a huge difference in how easy it is to board. In our experience, the extension of the boarding ladder inside of the life raft enables even those with minimal upper body strength or who are overweight to haul themselves into the life raft. We consider the inside boarding ladder, along with exterior ladder or inflatable platform, to be a minimum requirement when selecting a raft.

We feel that Winslow and EAM best implement this feature.

The most capable entry aids are inflatable platform entries—optional

MANUFACTURER	MODEL	CAPACITY	WEIGHT	TUBES/CELLS	CANOPY	ENTRY AIDS	BALLAST	INFL. FLOOR?	MSRP
EAM	EAM-2B	2-3	14.5 LB	1/1	OPTIONAL	HANGING STRAP	0	NO	$2467
	EAM-5	4-5	20.5 LB	1/1	OPTIONAL	HANGING STRAP	0	NO	$2198
	T2	2	23.5 LB	1/2	MANUAL	HANGING STRAP	0	NO	$2912
	T4	4	36 LB	1/2	MANUAL	HANGING STRAP	0	NO	$3551
	T4S	4	37 LB	1/2	AUTO	2 RUNG & INT LADDER	4 X 100 LB	AUTO INFLATE	$4852
	T4AS-VIP	4	35 LB	2	AUTO	3 RUNG & INT LADDER	4 X 100 LB	OPTIONAL	$5852
	T6	6	45 LB	1/2	MANUAL	HANGING STRAP	0	NO	$3912
REVERE	AERO COMPACT 45-AC2V	2	13 LB	1/1	NO	HANGING STRAP	2 X 100	N0	$1075
	AERO COMPACT 45-AC4V	4	15.5 LB	1/1	NO	HANGING STRAP	2 X 100	NO	$1363
	AERO COMPACT 45-AC2VP	4	18 LB	1/1	MANUAL	HANGING STRAP	2 X 100	NO	$1575
	AERO COMPACT 45-AC2V-K1	4	20 LB	1/1	MANUAL	HANGING STRAP	2 X 100	NO	$1762
	AERO ELITE 45-AE4V	4	45 LB	1/2	AUTO	2 RUNG & INT LADDER	4 X 100	YES	$2944
	AERO ELITE 45-AE6V	6	50 LB	1/2	AUTO	2 RUNG & INT LADDER	4 X 100 LB	YES	$3081
SURVIVAL PRODUCTS	4-MAN BASIC	4	12 LB	1/1	NO	HANGING STRAP	0	NO	$1370
	4-MAN W/ CANOPY ONLY	4	14 LB	1/1	MANUAL	HANGING STRAP	0	NO	$1590
	4-MAN W/STANDARD KIT	4	19 LB	1/1	MANUAL	HANGING STRAP	0	NO	$1775
	4-MAN TSO W/ CANOPY ONLY	4	16 LB	1/2	MANUAL	HANGING STRAP	1 X 124 LB	NO	$2035
	4-MAN TSO W/ FAR 91 KIT	4	22 LB	1/2	MANUAL	HANGING STRAP	1 X 124 LB	NO	$2315
	6-MAN TSO BASIC (NO TSO CERT)	6	26 LB	2	NO	HANGING STRAP	1 X 124 LB	NO	$3715
	6-MAN TSO W/ CANOPY ONLY	6	28 LB	2	MANUAL	HANGING STRAP	1 X 124 LB	NO	$4015
	6-MAN TSO W PART 91 KIT	6	36 LB	2	MANUAL	HANGING STRAP	1 X 124 LB	NO	$4295
WINSLOW	RESCUERAFT 40SLRR	4	16 LB	1/1	NO	3-RUNG LADDER	OPTIONAL	OPTIONAL	$1495
	RESCUERAFT 60SLRR	6	23 LB	1/1	NO	3- RUNG LADDER	OPTIONAL	OPTIONAL	$1695
	RESCUERAFT 40SLRR2	4	19 LB	1/2	NO	3-RUNG & INT LADDER	OPTIONAL	OPTIONAL	$1945
	RESCUERAFT 60SLRR2	6	26 LB	1/2	NO	3-RUNG & INT LADDER	OPTIONAL	OPTIONAL	$2075
	ISLAND FLYER 46GAST	4	39 LB	1/2	AUTO	3-RUNG & INT LADDER	3 X 80 LB	OPTIONAL	$2975
	ISLAND FLYER 69GAST	6	42 LB	1/2	AUTO	3-RUNG & INT LADDER	3 X 80 LB	OPTIONAL	$3195
	DUALSAFE 46GADR	4	25 LB	2	OPTIONAL	4-RUNG & INT LADDER	3 X 80 LB	OPTIONAL	$2500
	DUALSAFE 69GADR	6	33 LB	2	OPTIONAL	4-RUNG & INT LADDER	3 X 80 LB	OPTIONAL	$2550
	ULTRA-LIGHT OFFSHORE 40ULO-BO1-1-103	4	32 LB	2	AUTO	4-RUNG & INT LADDER	5 X 80 LB	OPTIONAL	$3500

on the EAM VIP and all Winslow life rafts.

CANOPY

A canopy provides some protection from wind, rain and sun. It can be either manually erected or auto-erecting. The two common types either use an orally inflatable support tube(s) or multiple aluminum tubes, referred to as a "stick canopy." In stark contrast, auto-erecting canopies, as the name suggests, are automatically erected when the life raft inflates—no action is required of the survivor.

Based on our examination, we feel the optional stick canopies used by EAM in their classic life rafts, both approved and non-approved, are a terrible design. In our experience, most untrained people have considerable difficulty erecting this style canopy, and many find it impossible.

The Survival Products canopy has a single, oral inflatable support tube that goes in the center of the raft, resulting in a teepee-style canopy that is secured with ties at the corners. A slit in one side with a Velcro closure serves as an entry and allows for ample ventilation when pulled back, although it doesn't offer a great seal against heavy weather.

Revere's Aero Compact also uses an orally inflated support, but in this case it forms a square arch. The bottom of the Compact's canopy is secured with elastic over the tube. This canopy has no entry "door," per se, rather, one side is pulled up about halfway in the center to provide egress or minimal ventilation.

The standard auto-erecting canopies found on the more advanced life rafts from Winslow and EAM all feature single square-arch canopy support tubes. Their entries all have zippered closures. Winslow's canopies can be easily put down on the tube if desired. Winslow also offers the option of their Tri-Arch (three-way) canopy that provides considerably more headroom over much of the life raft, a definite improvement.

INFLATABLE FLOORS

An inflatable floor enhances survival chances in cold water, as well as being a huge improvement in comfort. This is standard on the single-tube Revere Aero Elite and EAM T4S, optional on EAM VIP and all Winslow life rafts. The Revere and Winslow floors are manually inflated; EAM floors are automatically inflated, a nice feature. Once inflated, they also provide flotation redundancy, an asset in single-tube life rafts. We believe that an inflatable floor should be available when flying over water colder than 65 degrees.

REPAIR KITS

Only the Revere Aero Elite, Winslow Ultra-Light Offshore and EAM's approved life rafts include a repair kit to fix a puncture—part of their included Survival Equipment Pack (SEP). The lack of a standard repair kit in the other rafts is a failing, in our opinion. With the exception of Winslow—which offers repair kits as an option—to get the repair kit you must get their optional, minimal SEP at much greater added cost. In our opinion, every life raft should contain the essentials of a hand pump, bailer and repair kit.

YOUR CHOICES

The chart on page 10 covers the salient differences between most of the available life rafts as well as pricing. We used MSRPs provided by the manufacturers; EAM said it will provide exact quotes on request to buyers. Some, particularly Winslow, offer a wide range of options to allow a raft to be tailored to the user's needs. Below, we'll take a look at some of the other notable issues that might bear on your selection of a particular life raft.

EAM WORLDWIDE

EAM 's non-approved, single chamber, single-tube life rafts, the EAM-2B and EAM-5, while rated at two-three and four-five persons, respectively, are the same size as their approved two- and four-person rafts. Don't kid yourself that they really accommodate another person when aviation life rafts are already rated at just 3.6 sq. ft. per person.

EAM's "classic" series of non-approved and approved single-tube life

continued on page 32

Buy a Pre-Owned Life Raft?

Many pilots considering a life raft purchase end up looking at "pre-owned" life rafts on eBay or other online sites. The apparent cost savings are not necessarily the entire story, and we urge potential purchasers to be wary.

As with any piece of safety gear, life rafts require regular service. That service is not inexpensive, often running hundreds of dollars, and in some cases, hidden damage to the raft can make it unusable. Significantly delaying service can increase the cost, so purchasing a raft that hasn't been serviced for many years is buying a pig in a poke. You have no idea if the raft is even serviceable.

Unless you are knowledgeable about the raft's history and service status—for example, buying from a friend—or if the raft has been recently serviced by one of the manufacturer's authorized service centers (and not just any service center), we suggest avoiding pre-owned life rafts.

Since rental life rafts tend to be bottom-end rafts, some pilots will purchase a higher end life raft for a particular flight and then sell it at a substantial discount. It's rare, but it can be an excellent buy.

CONTACTS

EAM Worldwide
305-871-4050
www.eamworldwide.com

Revere Supply Co.
877-738-3738
www.reveresupply.com

Survival Products
954-966-7329
www.survivalproductsinc.com

Winslow LifeRaft Co.
800-838-3012
www.winslowliferaft.com

Gear of the Year: Cirrus Aircraft

Cirrus Aircraft wins our Editor's Choice Award for the company of the year. Their innovative success leads the way in an otherwise dismal aircraft market.

When we visited the Cirrus Aircraft factory in Duluth, Minnesota, last month, we couldn't help notice the positive vibes that echo throughout the operation. There's reason for boardroom fist pumps. Production slots for the new G5 SR22 are sold out through October, the SF50 Vision Jet is well on the way toward certification and delivery in 2015, and the competition is struggling to sell half as many aircraft as Cirrus did last year.

Cirrus built a total of 253 aircraft last year alone. Unlike other manufacturers, Cirrus doesn't distribute aircraft to a dealer network, so production is based on customer orders.

We expect this trend of success to continue for Cirrus, given the innovation and consistent product improvements that are apparent in the latest G5 SR22 models. Moreover, we applaud Cirrus for taking a new stand on training, in hopes of improving the safety record of these advanced aircraft. To Cirrus Aircraft, we tip our editorial hats and award them the distinguished *Aviation Consumer* Gear of the Year award.

In addition to Cirrus Aircraft, here are more of our top picks from the last editorial year.

BEST LSA RETROFIT GLASS: GARMIN G3X

Garmin's original G3X could have been the brisk seller Garmin intended it to be if it were cheaper, had more functions and included an advanced autopilot. Thanks to Team X—a new engineering team who's dedicated to designing products for experimental and light sport aircraft—the new G3X has all of this and more.

With a new starting price of $4395—and $5875 with an advanced autopilot—in addition to a long list of advanced features and accessories, the G3X finally plays with Dynon and other big-name players in the experimental and LSA avionics world. It also has a price that's sure to catch the eye of thrifty light sport owners and kit builders.

The G3X suite can contain up to three PFD/MFD configurable displays. All screens have a built-in WAAS GPS with a 7-inch, high-resolution WVGA display. The G3X brings primary instrumentation, providing full PFD functions. This includes an advanced ADAHRS plus integrated electronic engine instrumentation. There's also synthetic vision, terrain and obstacle alerting, geo-referenced FliteCharts and SafeTaxi airport diagrams. For more, see www.garmin.com.

BEST IPAD GPS: BAD ELF GPS PRO

The $180 Bad Elf GPS-2200 Pro is both a GPS receiver and a position datalogger that can stream Bluetooth GPS position to multiple devices at the same time. Its water-resistant case—which measures 3 x 2.4 x 0.7 inches and weighs 3.2 ounces—is designed to hang around the neck,

which we find convenient in the cockpit and for taking it on the go. It also offers exceptional GPS performance, with fast and reliable lock-on in every cabin we've used it in. For more, see www.bad-elf.com.

BEST BUDGET ANR HEADSET: LIGHTSPEED SIERRA

The $600 Lightspeed Sierra ANR is proof that you don't have to spend big to get quality headsets. The Sierra weighs in at 16 ounces and has a high-quality and rugged feel.

In our budget ANR shootout, the unit earned cheers for comfort and solid audio performance, much in part for its oblong headband design that limits clamping pressure. There's a long list of standard features, including stereo music input, Bluetooth cell phone connectivity and long battery life. We were so impressed with the Sierra's quality and value that we bought a pair for ourselves. For more, see www.lightspeedaviation.com.

BEST NEW NAVCOMM: GARMIN GNC255

We've wondered if the traditional navcomm radio might make a comeback if it had more advanced features—perhaps a built-in database for searching frequencies and better yet, an interface that can connect with a panel-mounted GPS for sharing navigation data.

Garmin has done just that—replacing the current line of SL-series navcomms with a completely redesigned line, to include the GNC255 navcomm and comm-only GTR225. While we wish the radios were plug-and-play compatible with the SL-series, installers can use much of the existing wiring when making the transition.

The radios have an internal frequency database of airports and VOR stations, liberal amounts of databus interface for cross-brand compatibility and can play with a wide variety of vintage CDIs and EFIS displays.

At $4495 for the GNC255A navcomm and $1995 for the entry-level, comm-only, GTR225, we think these radios fill a void in a market which still has a need for standalone navcomm equipment. Visit www.garmin.com for more..

BEST OIL FILTER: TEMPEST ORIGINAL

We put a fresh set of eyes on spin-on oil filters and declared the Tempest Original the winner over Champion's filter. It was a close call but we like Tempest's by-pass valve design, its filtering ring magnet and best of all—its lower price. For more details, see www.aeroaccessories.com.

BEST IPAD APP: WING X PRO7

With the widest and most sophisticated featureset, relative ease of learning and customer-centric nature (running on an expired subscription), we picked WingX Pro over a tough field of candidates. It covers the basics, including flight planning and filing, weather retrieval and imagery and inflight navigation, but has two exceptional features: it works with the broadest array of remote devices such as ADS-B traffic and weather, and its moving map functions are the most complete and flexible. The basic structure is menu-driven or just about everything can be done from one of the map pages. On the iPad mini, the largish, bright buttons are a help. Visit www.hiltonsoftware.com for more details.

BEST TURBINE CONVERSION: SOLOY CESSNA 206/207

Hanging a 420-SHP Rolls Royce 250-C20S on a Cessna 206 or 207 and making a number of tweaks and mods, Soloy turns Cessna's snarling utility van of the sky into a quiet, neighbor-friendly hauler that will carry well over a half a ton in the cabin—with full fuel.

Cessna's 206 and 207 have long been in use across the planet—especially in remote areas—although with avgas becoming increasingly hard to get in the boonies, their utility has started to dwindle.

Because jet fuel can be found almost anywhere, Soloy's conversion means that the rugged airframes have been given a new lease on life in the developing world. The most recent Mark II conversion of the 206 using the Rolls Royce 250-B-17/2 engine has a lower thrust line, better visibility over the nose, plus the turbine reliability and power that's unmatched by a piston. Price for the basic conversion is on the order of $600,000. For more details, visit www.soloy.com.


Soloy Cessna 206 turbine

BEST ALTITUDE MINDER: ICARUS SAM

The first time the FAA comes after you for an altitude bust, the price of an altitude alerting unit suddenly seems insignificant. The panel-mounted $1795 Icarus SAM's design allows easily setting a desired altitude

when climbing or descending as well as decision altitude on approach. The voice callouts are intuitive, can be silenced if you don't want them or repeated if you missed one. The unit has other features—including a gear warning and alternate round bezel. Visit www.icarusavionics.com.

BEST BUDGET TRANSPONDER: SANDIA STX165

We think installing a new digital transponder makes better sense than repairing an old one. At $1700, the Sandia STX165 is designed to take up minimal space and has a built-in altitude encoder. The unit also outputs pressure altitude on an RS 232 serial data buss for seamless

interface with other avionics that require altitude data input, including GPS navigators, altitude alterters and other integrated systems. See www.sandia.aero for more.

BEST AIRCRAFT MOD: KING KATMAI

With a stall speed of 31 knots, climb rate of more than 1500 FPM, the same cruise speed and fuel burn of a straight Cessna 182 and no handling vices, the 300-HP King Katmai is at home deep in the bush or at the busiest international airport. A lifting canard means that the airplane has a nearly flat deck angle when maneuvering at low speeds, giving far better forward visibility than other STOL machines.

The greatly beefed-up tricycle gear reduces the risk of runway loss of control accidents that plague tailwheel airplanes, and a gross weight increase allows a cabin load of 718 pounds even with full fuel (77 gallons). For more, visit www.katmai-260se.com.

BEST 406 PERSONAL BEACON: ACR RESQLINK+

If all you have is a legacy 121.5 MHz ELT, a 406 MHz Personal Locator Beacon is a must. It can also serve doubl duty for outdoor adventure activities. We think that a PLB should

have GPS positioning to let rescuers know precisely where you are, contain a strobe light to help them spot you, should float and be operable with one hand.

With a 24-hour battery life, ACR's ResQLink+ meets all the requirements, plus it's relatively small and is priced at less than $300. Other units are either larger, more expensive or don't have all the features. Just be sure and register the device after you get it so rescuers will know what name to call out when hunting for you. For more information, visit www.acartex.com.

BEST PORTABLE EFIS: DYNON D1

Based on our evaluations, we think the $1425 Dynon D1 pocket EFIS can be a good choice for owners seeking cost-effective backups for their creaky vacuum instruments. The D1 has a MEMS solid-state gyro system just like full-scale EFISs.

Since it's strictly a portable unit, it has no air data access. Instead, speed and altitude are GPS-derived through a built-in receiver. Clever. For mounting, Dynon provides a cradle that mates to a RAM suction cup mount that works well on a side window. There's also a device called a "pinch" mount that allows the D1 to snap into an empty instrument hole, while remaining an easily removable and portable footprint. See more at www.dynonavionics.com.

King Katmai 182

Buying ADS-B Now: Should You Bother?

Lots of owners are asking that very question. While there are benefits to buying mandate-ready ADS-B now, there may be more in waiting.

by Paul Bertorelli

CHECKLIST

- Portable ADS-B delivers free weather products effectively.
- 978 MHz transceivers offer credible traffic and free weather. They're mandate ready.
- With more than six years to wait for the ADS-B requirement, what's the rush?
- Portables shouldn't be thought of as any kind of serious traffic solution and are irrelevant to the mandate.

The avionics industry gets big props for producing sophisticated, ever-more-capable products, but lately they've excelled at producing something else: confusion.

The veritable gusher of portable ADS-B products that appeared last spring has devolved an already chaotic market into a state of utter confusion that even we have trouble sorting out. To be fair, the FAA is to blame for proposing an ADS-B system that only Rube Goldberg could love and maybe not even him. So it's time to ask of ADS-B—as many readers are—what's in it for me? Why should I buy this technology and when?

YOU GOTTA

The answer to why is the FAA equipment mandate, which requires that by 2020, all aircraft flying in certain airspace will be required to have ADS-B. The airspace conforms roughly to where Mode C is now required: Class A, B and C airspace or in any airspace above 10,000 feet MSL. Aircraft operating above 18,000 feet will be required to broadcast position and other data on 1090 MHz, the so-called extended squitter now available in products like Garmin's GTX 330ES. Behind the why is that the FAA will use datalink technology from ADS-B to separate aircraft in lieu of radar, although radar is certain to be around for years to come. (That's why you'll still need a Mode-C transponder in airspace where it's required now.) Being *required* to have something and actually *wanting* it, however, are different things. As the FAA sees it, the pot sweetener in ADS-B is the "B" itself, which stands for broadcast. In exchange for the stick of the FAA mandate, the carrot is free inflight weather and traffic reporting. Although the weather part is simple to grasp, the traffic protocol certainly isn't and some owners are finding that it costs a small bundle to get all the traffic they thought was going to be free. More on that later.

First, if you're asking why upgrade to ADS-B now or ever, you should really be asking what you want for inflight weather service, how much you're willing to pay for that and whether you want traffic of any kind. All decisions about equipage before the mandate should flow from there.

ADS-B weather—really FIS-B weather available through the ADS-B ground network—is the easy part. This is available through so-called ADS-B In protocol from devices that are receivers only; no outbound transmissions and thus nothing to do with the FAA 2020 mandate.

Given the flush of portable ADS-B devices this year, this is the hot part

Garmin's GDL 88, lower left, is mandate ready and plays FIS-B weather on the GTN 750, among other displays.

Portable ADS-B units like the Stratus II and Sagetech Clarity, top, provide FIS-B weather but not serious traffic. FreeFlight's XPLORER, lower photo, is a blind box product with ADS-B features similar to portables.

of the market. We reviewed the latest crop in the June 2013 *Aviation Consumer* and we think more receivers are on the way. There are at least two receive-only remote-mount boxes that do what the portables do—one from Aspen and another from FreeFlight. See the chart at right for the specs.

As far as what weather products you get for free, these are described in AIM 4-5-9 and include NEXRAD, basic text weather, NOTAMS and special-use airspace warnings. While FIS-B uses the same data sources as does XM WX satellite weather, we wouldn't call them equivalent by any means. XM weather is more timely and complete and has more analytical products. FIS-B is just the basics. If you have no inflight weather now, ADS-B In only will be an upgrade or perhaps budget relief if you're tired of paying XM subscription fees.

TRAFFIC: NOT SO SIMPLE

If you want electronic airplane spotting, ADS-B gets more confusing—a lot more confusing. ADS-B's conceptual foundation is that airplanes report their position, altitude, speed and other data via datalink to FAA ground stations—this is ADS-B Out in NextGen speak. Besides the ADS-B Out transmitter, the aircraft also requires a WAAS GPS capable of 5Hz position updates. Some ADS-B boxes include the WAAS receiver, some don't. And you can't use your old Garmin GNS 530; you need approved WAAS GPS.

Just to heap complexity upon confusion, ADS-B uses two frequencies. The standard 1090 MHz transponder frequency is one, 987 MHz or the Universal Access Transceiver band, is the second. The 1090 boxes are just Mode-S transponders equipped to transmit an extended squitter pulse to send the required ADS data. They too require WAAS GPS, but they have no ADS-B In capability. It's the stick without the carrot.

UAT boxes, on the other hand, are purpose-made transceivers that send the required position pulse, but also receive the weather and traffic goodies. Moreover, the 978 MHz equipment—of which there are at least three choices—makes you an official participant in ADS-B.

Participant? Why would you care? This is where many ADS-B buyers think they're getting something they aren't. ADS-B functions by compiling position reports from participating or client aircraft and crunching this data into an outgoing data packet to a specific aircraft. That data shows where nearby aircraft are located, complete with relative altitude and target trends. Through the datalink, UAT receivers will also show Mode-C targets so, barring any antenna shadowing, you'll see every transponder-equipped thing there is to see.

And this is where portable and ADS-B In-only receivers fall apart. Without ADS-B Out, you're not a participant, so you get no custom traffic data packet. If there's a participating aircraft nearby, lucky you; you might see his traffic packet. But it won't be centered on your airplane and will be of limited use. You'll also see random targets that may be on the fringe coverage of other participating aircraft. Because ADS-B In receivers receive 1090ES and 987 traffic directly, you'll see them. Most of these are airliners equipped with 1090ES but unless they're approaching the airport, most will be in the flight levels, thus of little concern for low-altitude light aircraft.

Bottom line: ADS-B In—mainly the portables—isn't a traffic solution worthy of the name. Traffic performance will vary widely and you can't count on seeing everything and sometimes perhaps not anything that's a threat.

BUY OR NOT?

Getting back to the original question, what's in ADS-B for you? The mandate is 6½ years away, by which time you may have sold your airplane and bought an RV or a boat. It's a long timeline and we suspect there will be more competition in ADS-B, both in price and features.

If you don't care much about traffic but would like to cash in on that free weather, the portables or the two blind-mount ADS-B In receivers (Aspen and FreeFlight) are inexpensive choices. See the June 2013 article for our recommendations on portables. Dial down your expectations, and these are good values, in our view.

For a serious ADS-B traffic solution right now that also meets the 2020 mandate, you'll need to write some checks and that means a 978 Mhz UAT box. As shown in the chart, Garmin's GDL 88 qualifies, as does Aspen's ATX200G or FreeFlight System's RANGR XVR. Check the chart to see which of these have onboard WAAS GPS options and which will require a discrete, ADS-B-approved WAAS GPS source. Another company, NavWorx, has the ADS600-B UAT product, but it's not TSOd yet.

If you're of a mind to mix and match, you could satisfy the ADS-B Out requirement with a 1090ES transponder—the Garmin GTX 330 or GTX33 remote or the Trig TT21—then use another receiver, including a portable, to receive traffic and weather data. This is a minimally intrusive approach that meets the mandate.

For the seriously paranoid, active TCAS-type traffic systems are worth the money. In its 800-series traffic boxes, Garmin has combined active traffic with the ADS-B passive traffic protocol and although this isn't specifically an ADS-B solution—it has

SELECT ADS-B PRODUCTS

COMPANY/ PRODUCT	ADS-B SPECS	INTERFACES	MEETS MANDATE?	PRICE	COMMENTS
CERTIFIED ADS-B EQUIPMENT					
ASPEN ATX200G	DUAL-BAND ADS-B UAT TRANSCEIVER WITH ONBOARD GPS	ASPEN EFIS, CONNECTED PANEL	YES	$4995	One of three 978 MHz UAT products that meets 2020 mandate and provides TIS-B and FIS-B. ATC200 is a variant without GPS priced at $3995.
ASPEN ARX100	DUAL-BAND ADS-B IN ONLY	ASPEN EFIS, CONNECTED PANEL	N/A	$1695	Good choice for an owner who has ADS-B Out covered with a 1090ES transponder. It provides FIS-B and TIS-B access.
FREEFLIGHT SYSTEMS RANGR XVR	SINGLE-BAND ADS-B UAT TRANSCEIVER	ADS-B COMPLIANT MFDS, TABLETS THROUGH WIRELESS	YES	$3665	Requires external WAAS GPS; receives FIS-B and TIS-B. RANGR-TX version meets mandate with ADS-B Out only and sells for $3305.
GARMIN GDL 88	DUAL-BAND ADS-B UAT TRANSCEIVER	GARMIN ADS-B COMPLIANT PANEL MOUNTS, OTHER DISPLAYS	YES	$3995	Four versions are available. Price at left is for GDL 88 using external GPS source. Onboard GPS version sells for $5995. There are also two versions that use dual or diversity antennas.
GARMIN GTX 330ES	MODE-S 1090 TRANSPONDER WITH EXTENDED SQUITTER	N/A	YES	$4389	Meets ADS-B Out requirement with extended squitter. No ADS-B In capability. Remote mount version is the GTX 33. Requires WAAS GPS.
TRIG TT31	MODE-S 1090 TRANSPONDER WITH EXTENDED SQUITTER	N/A	YES	$2889	Similar to Garmin's GTX 330, the TT31 and TT22 starting at $2595 meet the mandate via extended squitter.
NON-CERTIFIED/PORTABLE ADS-B EQUIPMENT					
APPAREO STRATUS II	DUAL-BAND RECEIVER WITH AHRS MODULE	IPAD ONLY	NO	$899	Functions only with ForeFlight app. Built-in GPS. Reviewed June 2013
FREEFLIGHT SYSTEMS XPLORER	SINGLE-BAND (978 MHZ) FIS-B ONLY RECEIVER	TABLET COMPUTERS THROUGH WIRELESS	NO	$695	FIS-B receiver only, but with approved ADS-B Out, it can receive TIS-B traffic.
GARMIN GDL39	DUAL-BAND RECEIVER FOR FIS-B AND TIS-B	TABLETS VIA GARMIN'S PILOT APP	NO	$699	Similar to other dual-band recievers. App uses Garmin's target-trend feature. Built-in GPS. Reviewed August 2012.
LEVIL TECHNOLOGY ILEVIL	SINGLE-BAND FIS-B, TIS-B RECEIVER WITH AHRS MODULE	TABLETS VIA WINGX AND LEVIL UTILITY	NO	$1195	Unique solar cells to extend battery life. Built-in GPS. Reviewed June 2013.
SAGETECH CLARITY SV	DUAL-BAND FIS-B, TIS-B RECEIVER WITH AHRS MODULE	TABLETS VIA WING X AND LEVIL UTILITY	NO	$1400	Only portable ADS-B with synthetic vision. A non-AHRS version sells for $1150. Reviewed June 2013.
ZAON MX1020	COMBINED TRANSPONDER AND ADS-B TRAFFIC DETECTOR	DISPLAYS ON GARMIN PORTABLES	NO	$599	Works in tandem with Zaon PCAS to display both ADS-B and Mode- C targets.

no Out function—it is traffic and collision avoidance in its most complete form. In its TAS series, Avidyne plans to offer similar capability.

The FAA's ADS-B ground network is nearly complete and provides low-altitude coverage in most parts of the country. But the FAA's coverage maps clearly show gaps at some altitudes, especially in the mountain west. That means no weather on the ground before takeoff and no traffic except what the receiver can see directly.

RECOMMENDATIONS

One way to think of ADS-B is as a small snowball at the top of a hill. In mid-2013, it hasn't gained much momentum or size, but as we approach the mandate and more owners equip, more aircraft will participate and be visible as targets. Further, the ground network will improve, although some altitude gaps will remain.

In our view, owners who aren't desperate for inflight weather and/or traffic solutions they wouldn't otherwise invest in can give ADS-B a pass for three or four years. In that time, more products will emerge and experience with installations will increase. We see no benefit in a rush to equip. You can always buy an inexpensive portable to receive FIS-B weather. Just don't think of it as a serious traffic solution.

Speaking of traffic solutions, this will be a conundrum until the mandate kicks in. A UAT receiver such as Garmin's GDL 88 (or the Aspen and FreeFlight equivalents) is a complete, mandate-ready ADS-B In/Out solution with good traffic capability. But UATs can't overcome the basic shortcomings of the ADS-B network, so their traffic sensing will have low-altitude gaps where an active traffic system would not. That's the logic behind Garmin and Avidyne's combined active/ADS-B products.

For the short term, active traffic systems—which aren't cheap—remain the top choice for effective, relatively gap-free traffic monitoring. As the mandate approaches, ADS-B may look more appealing, but it doesn't yet.

FIELD REPORT

Engine Shop Survey: Field Overhauls Win

But they aren't created equally. Choosing a shop with a proven record for good communication and warranty support is a smart plan.

by Larry Anglisano

It goes from bad to worse. You sense something isn't right with your engine, so you ask your shop to have a look. Hopefully it's a fouled spark plug. Wishful thinking didn't help because your shop called with news that you hoped not to hear for at least a few years: It's time for an engine because half of the cylinders have low compression and there are valve problems, too. The shop suggests an overhaul.

With dollar signs dancing in your eyeballs, it's decision time. Do you opt for a field overhaul or buy a factory engine? How about cylinders, hoses, engine mounts and downtime? These are major considerations.

The engine shop market is changing, so we conducted an engine shop experience survey on sister site AVweb.com to get a feel for how engine shops and the components they use are performing. We heard from 200 respondents. There were good, bad and awful experiences—here's what we heard.

CYLINDERS AND PARTS

We conducted a cylinder survey in the April 2012 issue of *Aviation Consumer,* where Lycoming and Superior Air Parts (ECI) earned high marks for customer service and owner satisfaction. Based on our latest engine shop survey, Lycoming cylinders remain the most popular choice, at 34 percent, while ECI came in second at 19 percent. Continental cylinders earned high marks, also.

This trend was confirmed by shops we spoke with, who said that unless the customer requests otherwise, they often stick with factory cylinders. But the perceived best-of-the-best quality is sometimes only as good as the factory representative you speak with.

"Lycoming had the newest guy answer the phone and that lack of knowledge scared me off. I sent out my old cylinders, with a tracer on the cylinders to ensure that I got the same ones back from the shop," said the owner of a Luscombe.

Others, like Cessna 210 owner William Miller, had bad luck with would otherwise seem like the best option—a new Continental engine.

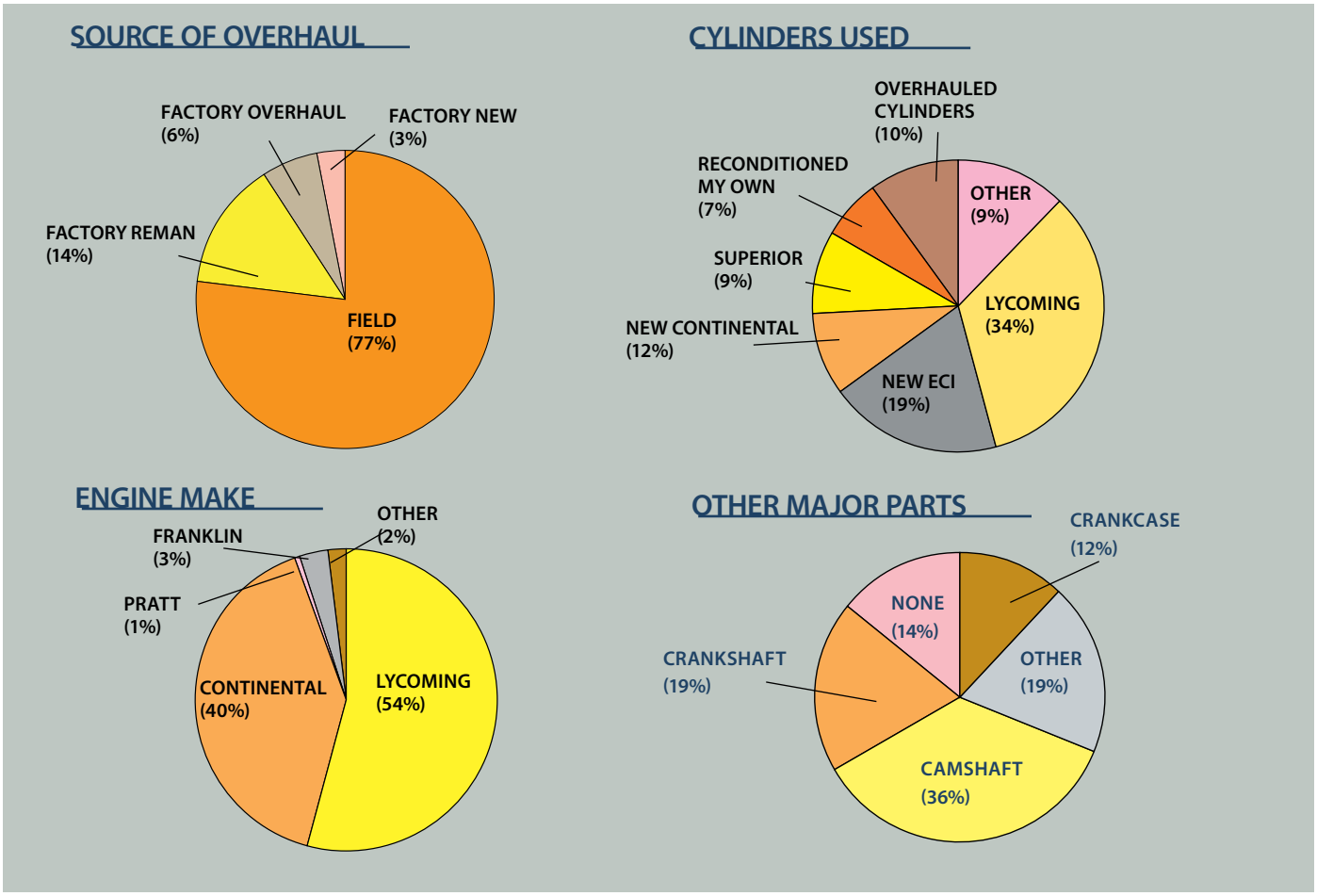
"Within the first 250 hours the exhaust valves and guides started to wear out. Continental didn't want to stand behind their product, saying it was my fault. They finally replaced the first two sets of exhaust valves and guides. Then the rest of the cylinders had the same problem. I elected to use Superior valves and guides and had no further trouble, except with the first two that I used Continental parts on. I replaced them with Superior parts and have had over 1000 hours of trouble-free flying. I would not put Continental parts on my engine even if there was no other choice," Miller told us.

Lycoming factory overhauls aren't always perfect either, but could pay off in convenience when faced with a failure.

"The crankshaft oiler elbow dropped out of the crankshaft at 97 hours. Lycoming sent me another engine. While pilots on the field recommended an independent shop, I doubt the shop could have obtained a replacement engine," said a Mooney owner of his IO-360 issues.

If you're concerned about corrosion, ECIs Nickle+Carbide surface treatment is standard on ECI cylinder overhauls. The treatment is supposed to provide a harder, more corrosion-resistant surface than steel barrels. We'd consider it for engines that see little use. On the other hand, only 9.5 percent of the respondents reported premature corrosion problems.

Speaking of corrosion, we also asked about engine preheater use, since improper use of electric preheaters might lead to condensation and corrosion inside the engine. Thirty-eight percent said that they preheat when they plan to fly the aircraft within a day or so, in cold weather. Seven percent preheat all the time in cold weather, and a surprising 55 percent reported that they don't preheat at all. We'll look at this



topic further in a future evaluation and follow-up article.

SHOP MATTERS

We understand that not every customer/shop relationship is a love-fest but we heard some nightmares about one popular shop, teaching a valuable lesson on the importance of customer service.

According to a Cessna 337 owner (who didn't wish to be named, given all that he's been through), "The engine overhaul was a total disaster. I sent it to New Firewall Forward in February 2011 and paid over $27,000 up front with a promise that I'd have the engine in two months. After two months, they quit returning my calls. After seven months, I finally had the engine—in pieces—shipped to another overhauler, where work was actually done (I had paid for new Superior cylinders, but never got them). New Firewall Forward promised a refund. I never saw a cent. In the end, it cost me over $50,000 to get my engine overhauled. I made a complaint to the Better Business Bureau and the Colorado Attorney General—neither one was able to get anything from New Firewall Forward."

Dennis Weatherald is another unhappy Firewall customer. "After countless calls, fronting them the money for the parts on two different occasions, I finally flew in after seven months to see what was going on. I discovered that the mechanics are hard-working guys that will talk to you, but I don't know how they stay in business," he said.

We gave New Firewall Forward a chance to respond to these reports and easily got New Firewall Forward's Tom Lawson on the phone.

"We are aware of previous issues customers have experienced with our shop because we read about it on the Internet," he said. According to him, these problems date back to the 2011 time frame and have since improved.

"In order to improve our performance and guarantee customer satisfaction, we've made several internal policy changes and personnel adjustments. We do have many satisfied customers," Lawson told us.

On the favorable side, shops like Zephyr Aircraft Engines in Florida

Field overhaul—rather than new cylinder kits—is a way to save money, if they are mid-time. Lycoming and ECI continue to be top-pick cylinder replacements.

I WOULDN'T GO ANYWHERE ELSE

That's the selection we were looking for when we asked readers if they would go back to their engine shop. Face it, even high-ranked shops get some negative reports. It's also unrealistic to expect every engine overhaul to be problem-free. In our view, how the shop handles warranty issues, communication and turn-around time is just as important as a quality overhaul.

SHOP	LOCATION	OVERALL SATISFACTION	WARRANTY RATING	CONTACT
ZEPHYR AIRCRAFT ENGINES	Zephyrhills, FL	5.0	5.0	www.zephyrengines.com 800-204-0735
PENN YAN AERO	Penn Yan, NY	4.3	3.8	www.pennyanaero.com 800-727-7230
RAM AIRCRAFT	Waco, TX	4.6	5.0	www.ramaircraft.com 254-752-8231
WESTERN SKYWAYS	Montrose, CO	4.0	3.2	www.westernskyways.com 800-575-9929
POPLAR GROVE AIRMOTIVE	Poplar Grove, IL	4.2	3.8	www.poplargroveairmotive.com 800-397-8181
TRIAD AVIATION	Burlington, NC	4.2	4.0	www.hhtriad.com 336-227-1467

That's why we looked at overall satisfaction, warranty ratings and the popularity of the shop to help determine which overhaul shops deserve top-dog recognition (see chart).

Seventy-seven percent of customers didn't have warranty claims, which tells us that field overhauls can be a good option. The trend is to overhaul to new tolerances, rather than serviceable tolerances—a service we think makes sense.

For quality of overhaul, warranty performance, customer service response and overall performance, the survey rated shops on a five-point scale—awful, not good, acceptable, good and terrific (five is the highest). As we've stated in previous service surveys, shops that consistently get the highest marks from readers are the ones who don't surprise customers with cost overruns, deliver the work to the agreed-upon schedule (and if they slip, explain why) and, most important, answer and return phone calls. Communication between shop and customer has never been easier, thanks to email. Good shops make it a point to keep the customer informed of progress. Overall, 60 percent in the survey rated their service experience as terrific.

Last, remember that while it's acceptable to ship an engine across the country for overhaul, it can be more convenient to use a shop closer to the folks doing the installation. Freight costs might be lower, since engines are shipped in large containers. Sweeter yet is a deal from a shop that offers free shipping to help earn your business.

continue to earn raves for outstanding service and quality.

Baron owner Gerald McCarley is one happy camper. "Zephyr has great customer service. They worked for me to get some concessions from ECI on cylinders that had an AD. I wouldn't go anyplace else."

"Zephyr did my first rebuild and my local mechanic and I could not be happier," said Cherokee owner Jerry Metcalf.

"I like that I can call about anything and they will try to answer questions with real people on the phone," said Steven Boggess, about RAM Aircraft.

"This is the second time I've used Poplar Grove Airmotive and I would use them again. Highly recommended," said E.M. Beck. They overhauled the Lycoming O-360 in his Cardinal, including crankcase and camshaft replacement.

Perhaps more important than the overhaul is the warranty support after the job, evident by Bill Ques-

Replacing hoses, engine mounts and install labor is an added expense that you'll need to ask about. In the survey, hose replacement was included in only half of the rebuilds, as was the cost of removal and reinstallation.

nel's experience with Ly-Con Aircraft Engines in California.

"Bad lifters from Continental resulted in damage to my cam. Ly-Con paid to have the engine removed, replaced the cam and the lifters and reinstalled my engine under warranty. I had no further issues," he said.

You don't necessarily have to deal with larger shops for a favorable experience.

Doug Pendleton had favorable comments about Don's Dream Machines in Griffin, Georgia. They overhauled and upgraded the little Continental in his Aeronca for $16,000, which included new ECI cylinders, crankshaft, crankcase and camshaft.

"It was a fantastic experience. They have both expertise and quality," he wrote.

"Small shop, personal service, outstandingly talented and knowledgeable people," raved Cary Alburn of his dealings with Aircraft Cylinders and Engines, in Greeley, Colorado.

"Powermasters in Tulsa, Oklahoma, gave me an engine that is better than new," wrote Bonanza owner Joseph Fischetti. He spent $60,000 for his IO-550, which included crankshaft, camshaft and overhauled Millenium cylinders.

Twin Comanche owner Kris Widdison had good luck with One-Stop Aviation. They overhauled both IO-320s, replaced the camshafts and used overhauled cylinders. It cost $10,000 per engine. Too good to be true? "During my last annual, all compressions were still 78/80 and there was no metal in the oil, so the engines are holding up well," he told us.

IN-HOUSE WORK

Of course, the engine rebuild is only half of the job. You still have to pick a shop to coordinate the field overhaul and accomplish the physical removal, reinstallation, ground running and paperwork. The engine doesn't always need to be sent to a specialty engine shop.

Any certified powerplant mechanic with Inspection Authorization can perform the rebuild and sign it off in the logbooks. One IA we talked with admitted that local mechanics generally don't have access to specialty equipment, including valve seat grinders, boring and honing machines and other overhaul tooling. This part of the overhaul is farmed out to shops that do.

This isn't to say that we didn't hear about good experiences on the local shop level, where the shop technicians did all of the work.

"I was given a tour of the shop, met all of the people that performed the overhaul and I was very comfortable with the shop before they accomplished the overhaul," said Trinidad owner Fran Ladd. Signature charged $29,000 total for the overhaul of his Lycoming IO-540, which included new Lycoming cylinders. From our survey, this price point is average for a basic field overhaul on a common engine with a good case.

SURVEY SAYS

Drawing definitive conclusions from smaller surveys is difficult because a disgruntled customer could sink a shop's ratings if happy customers didn't respond. On the other hand, it was easy for us to spot the shops that nail customer service and win in overall customer satisfaction, even if some of their engines had issues.

Shops like Zephyr Aircraft Engines and Penn Yan Aero, for example, consistently earn top ratings in our surveys, which makes it easier for us—and clients—to recommend them.

It also proves that you don't have to buy a factory engine to get a healthy combination of quality, customer service and warranty support.

SHOULD YOU BUY A FACTORY ENGINE?

If you have your sights set on a factory engine, you'll need to do some homework. Here's an education on the rules, regs and factory offerings.

First, let's look at factory remanufactured. This isn't really an overhaul because you end up with a zero-time engine that's built to new engine standards. Some of the parts—including crankcase and crankshaft—may be reused, but you can expect that all of the top-end components are replaced with new ones. From a logbook standpoint, the engine is essentially new because only the factory can certify it as zero-time. FAR 91.421 says, in part, that the owner or operator may use a new maintenance record, without previous operating history, for an engine rebuilt by the manufacturer or by an agency approved by the manufacturer.

On the other hand, a factory overhauled engine isn't considered zero-timed. The total time on the engine remains the same (and keeps counting) but it earns the "zero-time since factory overhauled" status. A factory overhaul exchange isn't for you if you want your original parts—particularly if you're comfortable with your existing crankcase and crankshaft. After all, it is a known entity (and one you might want to get rid of).

Lycoming offers new, zero-time rebuilt and factory overhauled options. Factory-new engines may be purchased outright or on an exchange basis. They come with a two-year parts and labor warranty. A new IO-360-A1B is roughly $54,800, a zero-time rebuilt engine is $35,900 and a factory overhaul is $32,200, all depending on specific part numbers.

Continental offers two choices—new and rebuilt. A new TSIO520-T1B retails for $50,534, while a rebuilt retails for $45,472.

So-called boutique engines like the ones offered by RAM and Victor, for example, might be a better choice for those looking for customization and prestige which, in theory, increases the resale value of the aircraft. Like factory engines, you can expect a price delta of around 25-30 percent higher than average field overhaul prices. Still, we're not convinced a factory engine will better the resale value enough to consider it a slam-dunk option.

Belly Degreasers

The selection is big, the job is dirty, but most of the products work well. Ease of use is king—we like the all-in-one degreasers/cleaners.

by Rick Durden

For many pilots, the first realization that the bellies of their airplanes are becoming hazardous waste sites is when ATC advises that their transponders are intermittent. Investigation reveals a layer of goo on the belly antennas, doing its best to block the signal.

Frequently cleaning the by-products of engine operation—oil, grease, soot and other delicacies—off of the belly isn't just presenting a pleasing view to the world when over-flying, it helps keep the dorsal antennas working their best, keeps potentially corrosive materials off the paint and aluminum and lets you easily see whether the fasteners are in place or the paint isn't.

The idea is to be able to remove that coating of grease, oil and soot without having to wear a hazmat suit. For many of us, water isn't available at the hangar, or the airport requires that all washing be done on a wash rack that has a drain that catches the crud that comes off of the airplane—and it's a half mile away. That means that when it's time to just clean off the belly, we want to be able to do it without having to turn it into a major production.

> ***We found that price was not related, in any fashion, to the effectiveness of the degreaser.***

We wanted to see what commercial degreasers worked, how much they cost and how easy they were to use, with emphasis on ease of use. To start, we went to Aircraft Spruce's website, typed "degreaser" into the search box and were guided to 57 products. After weeding out those that were primarily targeted at cleaning engine parts, were not for painted surfaces or came in industrial-sized drums, we whittled the selection down to 25. We further ruled out most of the degreasers that could not be sold in several states, cutting the number to 17.

A few days later, we received two boxes of degreasers and headed for the airport, where we planned to try all of them on a Beech Bonanza that our local shop gleefully set aside for us because they weren't looking forward to cleaning its belly. They also made a Columbia 350 available so we could see how things worked on a composite airplane.

CHECKLIST

- ⊕ Belly grease isn't that hard to remove; most degreasers are adequate.
- ⊕ Aero Cosmetics Wash Wax spray is an effective all-in-one degreaser and wax.
- ⊖ At $46.75 for 75, GLI Grime Off Wipes are expensive, inefficient.

PACKAGING

We sorted the degreasers by their containers, rather than by contents. Packaging was aerosol, hand-pump spray bottle, solution to be mixed or wipes impregnated with the cleaner. The chemical makeup varied from toxic to non and flammable to not.

Having once been employed where a chemical poisoning took place, we are reluctant to use, and cannot recommend, a product that is toxic and does not specify on the label what's inside. That label may be all that's available to inform a medical team so that it can take proper action in time to save a life.

We did not test one of the degreasers we ordered, X-IT Carbon Remover and Cleaner. It was adver-

PRODUCT	MATERIAL	PRICE	UNIT PRICE	COMMENTS
AEROSOL				
AVL FAST ACTING CLEANER/ DEGREASER	TRICHLORETHYLENE	$7.95	$0.44/OZ	THE SPRAY EFFECTIVELY PENETRATES GREASE, EASING CLEANING; WIPED OFF CLEAN
CRC AVIATION DEGREASER	BROMOPROPANE TETRA-FLUOROETHANE	$21.75	$1.20/OZ	POWERFUL CHEMICAL SOLVENT; SPRAY AND WIPE OFF; EFFECTIVE; EXPENSIVE
FOAMING CITRUS CLEANER DEGREASER	MATERIALS NOT DISCLOSED	$9.95	$0.71/OZ	FOAM IS HARD TO USE ON THE BELLY; APPLIES AND CLEANS UNEVENLY; NOT RECOMMENDED
LPS HDX HEAVY DUTY DEGREASER	TRICHLORETHYLENE	$10.80	$0.57/OZ	HIGH HAZMAT; NOT LEGAL TO SELL IN 17 STATES; SPRAY EFFECTIVELY PENETRATES GREASE; WORKS FAST AND WELL
SIMPLE GREEN FOAMING CRYSTAL	POLYETHYLENEGLYCOL ETHER	$4.95	$0.25/OZ	NON-TOXIC; NON-CORROSIVE; FOAM DOES NOT APPLY EVENLY; NOT EASY TO USE ON BELLY; INEXPENSIVE
SPRAY BOTTLE				
AERO COSMETICS WASH WAX ALL DEGREASER	"WATER-BASED, NON-TOX-IC, BIODEGRADABLE"	$9.95	$0.62/OZ	WASH AND WAX IN ONE; GOOD FOR OLDER PAINT; SPRAY ON, WIPE OFF; SHINY FINISH; FAST
CESSNA ULTRA MAGNUM MULTI-PURPOSE AIRCRAFT DEGREASER	ALKALINE CLEANER	$17.76	$1.11/OZ	HIGH ALKALINE CLEANER; SPRAY ON, WIPE OFF; FAST; EFFECTIVE; NOT FOR POLISHED SURFACES OR BOOTS
NEVR-DULL NATURAL DEGREASER	PLANT-BASED SURFACTANTS	$7.50	$0.23/OZ	NO CHLORINATED SOLVENTS; SPRAY, WAIT 60 SECONDS, WIPE OFF; EFFECTIVE; PLEASANT ODOR, INEXPENSIVE
N'VRO SOLVE AIRCRAFT BELLY CLEANER/DEGREASER	PLANT AND FRUIT-BASED CLEANER	$14.90	$0.93/OZ	PENETRATED GREASE WELL; SPRAY ON, WAIT 30 SEC-ONDS, RINSE OFF WITH WATER
PPC CRUD REMOVER	SODIUM HYDROXIDE	$10.75	$0.54/OZ	SPRAY BOTTLE, ALTHOUGH IT NEEDS TO BE DILUTED; RINSE WITH DAMP RAG; NOT FOR POLISHED SURFACES
MIX/DILUTE—WATER REQUIRED				
CRYSTAL SIMPLE GREEN INDUS-TRIAL CLEANER/DEGREASER	2-BUTOXYETHANOL SODIUM CITRATE	$17.85	$0.12/OZ	DILUTED AS MUCH AS 20:1 WITH WATER, A GREAT VALUE; WORKS WELL; CAN BE A GENERAL CLEANER
MACH #1 DEGREASER/CLEANER	CITRUS SOLVENT AND EMULSIFIER	$24.70	$0.19/OZ	DILUTE WITH WATER AS MUCH AS 20:1; EFFECTIVE; MUST BE WASHED OFF WITH WATER
EARTH SOAP CONCENTRATED CLEANER/DEGREASER	SURFACTANTS	$7.95	$0.25/OZ	DILUTE WITH WATER AS MUCH AS 50:1; GENERAL CLEAN-ER AND DEGREASER, NON-TOXIC
WIPES				
GLI GRIME OFF HEAVY DUTY CLEANER & DEGREASER WIPES (75)	SURFACTANTS	$46.75	$0.62/WIPE	CLEANER-IMPREGNATED WIPES WORK, BUT ONLY CLEAN ABOUT TWO SQUARE FEET OF GREASY BELLY

tised as ". . . safe enough for daily aircraft cleaning and maintenance." Yet, once we had the product in hand and read the label, we saw that it was a commercial cleaning product, "not for the general public," and gave extensive warnings regarding protective apparel.

We also did not review Grez-Off Heavy Duty Degreaser From Spray Nine, as its label warned of potential damage to paint and called for a spot check before using—something not mentioned in advertising.

A number of available degreasers could not legally be sold in 17 states due to the hazardous nature of their contents. Most were for hard-core grease removal—more oomph than is really needed for cleaning an airplane's underside. We evaluated only one of those, LPS HDX Heavy Duty Degreaser. It worked well, but there were cheaper, safer alternatives.

We found that price was not related in any fashion to the effectiveness of the degreaser. We purchased the smallest container available, so a particular unit price listed could potential be lower with a larger purchase—including 55-gallon drums for some degreasers.

AEROSOLS

We purchased and evaluated five aerosol degreasers with unit prices ranging from $0.25 per ounce through $1.20 per ounce. Two, including the cheapest, Simple Green Foaming Crystal, were foams, which were not especially user friendly. They did not apply evenly and tended to drop off the belly in gobs, somehow timing it for when we were underneath. The foam penetrated and lifted grease well, but only where it had originally adhered, leaving a patchy result that took some elbow grease to fix.

The other three worked well. We particularly liked AVL Fast Acting Cleaner/Degreaser as the aerosol spray itself visibly penetrated and

Although belly grease and soot aren't usually all that difficult to remove, doing so generally means getting down and under.

lifted grease as we were applying the product. It was the best combination of price and effectiveness.

None of the aerosols provided a degreaser that could be used as a general cleaner. Because belly grease is not terribly hard to remove, we were looking for a product that could also be used to clean the rest of the airplane.

SPRAY BOTTLES

We purchased and evaluated five spray bottle degreasers with prices ranging from $0.23 to $1.11 per ounce. Again, price was not an indicator of effectiveness. One puzzled us—PPC Crud Remover was packaged in a spray bottle, but instructions called for it to be diluted before use, which meant another container was required to use the diluted stuff.

The most expensive, Cessna Ultra Magnum Multipurpose Aircraft Degreaser could not be used on polished surfaces. One, N'vro Solve Aircraft Belly Cleaner/Degreaser, calls for it to be rinsed off with water, something that may not be available.

One cleaner, Aero Cosmetics Wash Wax All Degreaser, claims to be not only a general cleaning agent for the entire airplane, but to wax it as well, all at once. We do not know how well the wax holds up in service, but when we followed the instructions, spraying it on and wiping it off with either a rag or paper towel, it left a slick, shiny surface.

All of the spray bottle products worked just fine, so our recommendation is to go with either the least expensive, Nevr-Dull Natural Degreaser at $0.23 per ounce, or the product that can be used for overall cleaning and waxing of the entire airplane, Aero Cosmetics Wash Wax All Degreaser. At $0.62 per ounce, it seemed a pretty reasonable all-in-one degreaser/cleaner/wax.

MIXES

If you have water available and drainage is not an issue, one of the degreasers that is diluted with water, can be applied with a long-handled brush and then rinsed off with a spray of water is probably the easiest and least expensive way to go about cleaning the belly.

We looked at three, ranging in price from $0.12 to $0.25 per ounce. All are to be diluted in service—the most expensive by as much as 50:1, while the least expensive by up to 20:1—so prices are pretty much a wash.

All three worked well—we wouldn't hesitate to choose any of them, although it should be noted that the Mach #1 Degreaser/Cleaner label specifically said that it cannot be left standing on the airplane—it must be rinsed off with water. Both Crystal Simple Green Industrial Cleaner/Degreaser and Earth Soap Concentrated Cleaner/Degreaser can be used as a general aircraft cleaner—so one product can do everything but wax the airplane, something we like.

WIPES

We had high hopes for the GLI Grime Off Heavy Duty Cleaner and Degreaser Wipes simply because we've used cleaner-impregnated wipes in other applications and they have proven tremendously handy.

We were disappointed.

At $46.75 for a tub of 75 wipes—or $0.62 per wipe—the price is high. In use, the wipes were effective in cutting grease, however, our experience was that each one was good for about two square feet of greasy airplane belly surface—and that was carefully using every square inch of the wipe. We also found that a damp rag or paper towel was still needed to get the last of the scum off the skin. We cannot recommend the GLI wipes.

CONCLUSION

After several hours of getting down and under, we came to a number of conclusions:

First, airplane belly grease, exhaust soot and general crud is not that difficult to remove—so industrial strength, high-hazmat chemicals generally aren't necessary.

Second, the products we tried worked as well on composite as on aluminum surfaces—after all, they are working on the paint, not the stuff under it.

Third, if water is available and easy to get to, the diluted mix and a long-handled brush is the easiest and cheapest way to deal with belly grease. We'd go with a mix that can function as an overall cleaner and degreaser, Crystal Simple Green or Earth Soap.

Finally, if water isn't easily available, we'd go with the all-in-one Aero Cosmetics Wash Wax All Degreaser. If the buildup is more than routine belly grease, we'd use AVL Fast Acting Cleaner/Degreaser.

Mooney Ovation

Big power and a slick airframe combine to generate one of aviation's true hot rods.

Mooney aficionados tend to be clustered in the end of the gene pool that has "I want a fast airplane" in the DNA. For years, they flocked to the marque that promised and delivered speed while sipping fuel. Starting with the single-seat Mite, they were willing to shoehorn themselves into tiny cabins in return for not having to stay in them long when going someplace, while assuming a certain look of superiority over others due to miserly demands at the gas pump.

Over the years, Mooney obliged its faithful with progressive aerodynamic clean ups, making quick airplanes steadily faster. However, Mooney eventually shocked the aviation world by tacitly admitting that they'd gone as far as was economically viable with aerodynamics, and it was time to accept that there's no replacement for displacement when it comes to sheer speed. It dropped a big-bore Continental into the latest iteration of the M20 airframe, creating the 190-knot M20R Ovation.

HISTORY

After tragic teething pains—the original M20 saw several in-flight breakups, resulting in abandoning wooden wing components—the basic Mooney airframe has been essentially the same since the M20C of the early 1960s. It consists of a semi-monocoque rear fuselage, metal-skinned steel tube cabin, a long and slender tapered wing and a distinctive tail with unswept leading edges. As well, major systems have remained unchanged throughout:

> ***Over the years, Mooney obliged its faithful with progressive aerodynamic clean ups.***

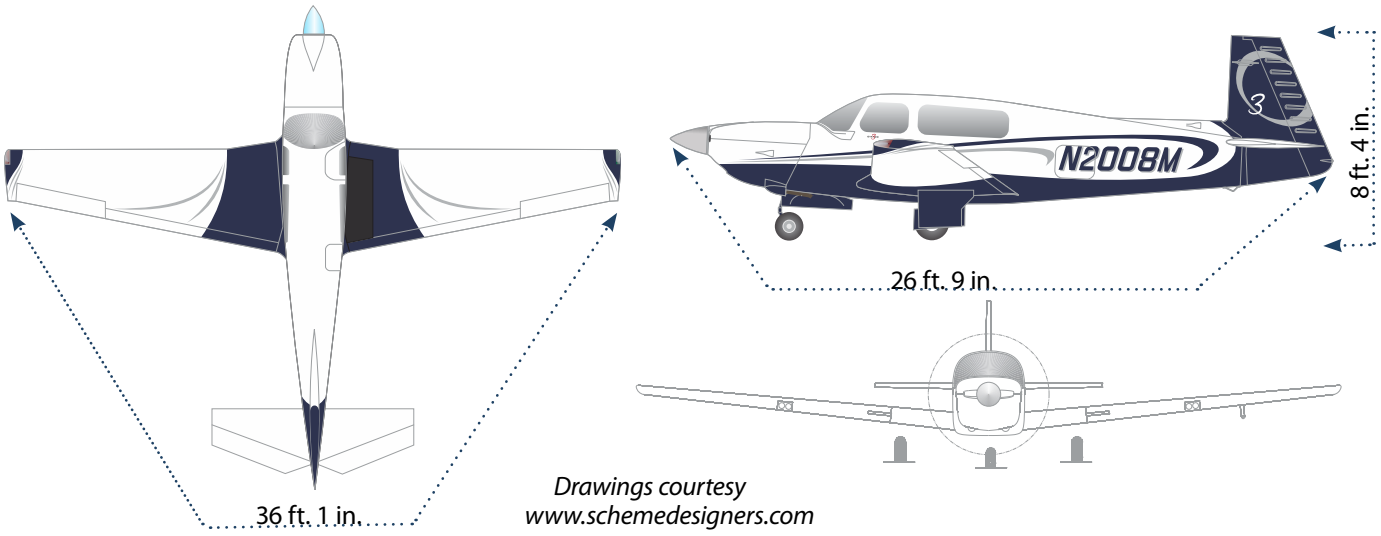
Trim is accomplished via a jackscrew moving the entire empennage; controls are pushrod-driven and the landing gear still uses a stone-simple trailing link design, with shock absorption handled by stacks of solid-rubber donuts.

The company, too, has been through several cycles of good and not-so-good times, and is currently only building and supplying parts, not complete airplanes. It changed hands more than once, encountering management and quality-control problems along the way. By the mid-1970s, the line was looking a bit dated and the company was in trouble yet again. Fortunately for Mooney, the right person for the job was in place: LeRoy LoPresti had earned legend status for his ability to get the utmost from an airplane through aerodynamic cleanups.

Already famous at the time for his work at Grumman-American, he applied his talents to the M20 series, resulting in the Mooney 201, which stood for the airplane's top speed in MPH. LoPresti made a number of changes, including a new cowling and more aerodynamic windshield. The interior was redone as well, with a new panel. Gone, too, were the old Mooney naming conventions (names like "Executive" and "Statesman").

The 201 became the pattern for all Mooneys to follow. Its first sibling was the turbocharged 231 (M20K, a designation also applied to the 252/Encore models), with its 210-HP Continental TSIO-360. In the 1986 model year, the M20K morphed into the 252, which lasted until 1990, and was resurrected with 220 HP as the Encore for 1997–98.

MOONEY M20R OVATION

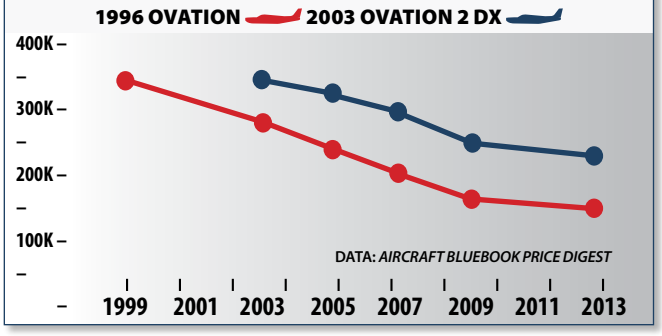


Drawings courtesy
www.schemedesigners.com

MOONEY M20R SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1994 M20R OVATION	CONTINENTAL IO-550-550-G5B	2000	$37,000	95	1168 LBS	191 KTS	±$135,000
1996 M20R OVATION	CONTINENTAL IO-550-550-G5B	2000	$37,000	95	1168 LBS	191 KTS	±$150,000
1998 M20R OVATION	CONTINENTAL IO-550-G	2000	$37,000	95	1168 LBS	191 KTS	±$185,000
2000 M20R OVATION 2	CONTINENTAL IO-550-G	2000	$37,000	95	1168 LBS	191 KTS	±$200,000
2003 M20R OVATION 2 DX	CONTINENTAL IO-550-G	2000	$37,000	95	1168 LBS	191 KTS	±$230,000
2005 M20R OVATION 2 DX/GX	CONTINENTAL IO-550-G	2000	$37,000	95	1168 LBS	191 KTS	± $250,000
2006 M20R OVATION 2 GX	CONTINENTAL IO-550-G	2000	$37,000	95	1168 LBS	191 KTS	±$280,000
2007 M20R OVATION 3	CONTINENTAL IO-550-G A/P	2000	$37,000	95	1168 LBS	191 KTS	±$310,000
2008 M20R OVATION 3	CONTINENTAL IO-550-G A/P	2000	$37,000	95	1168 LBS	191 KTS	±$325,000

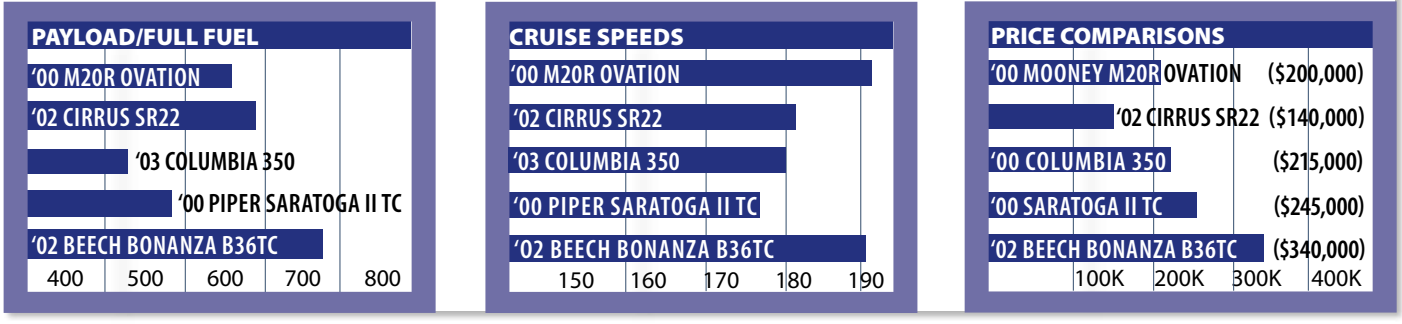
RESALE VALUES



SELECT RECENT ADs

AD 2012-05-09	INSPECT TAIL PITCH TRIM ASSEMBLY FOR SECURITY
AD 2008-02-06	INSPECT GARMIN 85 SERVO GEAR BOXES FOR FOREIGN OBJECT DEBRIS
AD 2007-05-04	INSPECT UPPER ENGINE MOUNTING HARDWARE AND FIREWALL
AD 99-11-07	DISABLE OR PLACARD A/C SYSTEM FOR CRUISE USE ONLY
AD 98-11-07	REPETITIVELY INSPECT AILERON CONTROL LINKS FOR CRACKS

SELECT MODEL COMPARISONS



Ovation in the outback—an Australian owner reported that his Ovation is ideal for that country's variety of airports and long distances between them.

The short-lived Porsche-engined PFM (M20L) was the first of what today are known as the "long-body" Mooneys, even though the M20J/K models had been stretched once already when compared to their M20C/D/E forebears. Lasting only two years and for 41 copies, the PFM begat the M20M, debuting as the TLS. It was the first true "big-bore" Mooney, sporting a turbocharged Lycoming TIO-540 of 270 HP. Known as the TLS/Bravo and later, simply Bravo, it went out of production in 2006 when the company shifted all its current powerplants to Continental's 550 cubic-inch platform. In 1999, Mooney dropped the M20J/201 in favor of the M20S Eagle, also built on the longer fuselage first used for the M20L.

The Ovation series, also using the long fuselage, first appeared for the 1994 model year, rolling out the factory door at an average equipped price of $281,500. From the beginning, it was powered by Mooney's version of Teledyne Continental Motors' popular IO-550, the -G, featuring a tuned induction system. The IO-550-G lacks altitude-compensating fuel metering, so the pilot must lean the mixture manually.

Mooney derated the IO-550-G to 280 horsepower by limiting maximum RPM to 2500. This probably contributed to the engine's official 2000-hour TBO when other IO-550s saw only 1700 hours.

Prior to production ending in the 2009-2010 time frame, the Mooney lineup consisted of the M20R Ovation 2 GX (280 HP), the Ovation 3 (310 HP IO-550-G with a 2000-hour TBO), plus the Acclaim and Acclaim S, both basically turbocharged versions of the 280-HP Ovation 2 GX with 2000-hour TBOs.

YES, IT'S A MOONEY

Compared to earlier Mooneys, the most noticeable difference on the Ovation's exterior is a sculpted cowl sloping down to a pair of too-small-looking cooling inlets. These inlets still manage to provide adequate airflow. No cowl flaps are fitted, so cooling air exits past the dual exhaust pipes.

The interior belies Mooney's reputation for cramped and uncomfortable cockpits. The company consigned the chintzy plastic interior panels from prior models to the waste heap. All interior panels on the Ovation are a laminated composite material with very nice natural wool or synthetic coverings. This really upgrades the cabin's looks, in keeping with the contemporary, upper-end tenor of the aircraft. The composite panels also reportedly attenuate sound better than the thin plastic they replace.

The seating position is classic Mooney; you sit low with your legs straight out in front. It takes some getting used to. The difference the longer fuselage makes is most obvious in the rear seats, which are considerably improved over the torture devices they simulate in the short-fuselage Mooneys.

A complement of six exterior lighting switches is on the overhead, two of them split switches. Mooney, to its credit, makes sure everyone has the best possible chance of seeing you coming. Inside are the traditional map lights under the yokes, area lighting in the glare shield and individual adjustable lights for each seat in the overhead.

A standby vacuum system was standard equipment, as was dual 24-volt batteries (located in the tailcone for balance considerations). A rocker switch toggles from one battery to the other. Either can be used for all operations and they can be switched at any time, but both cannot be used at the same time. It isn't a dual bus system, just dual batteries. A second alternator was offered as an option; it was required for the "known-ice" option. It later became standard equipment. If yours is an older one without, the dual batteries at least give you ample standby reserve in case of an alternator failure.

Those first Ovations routinely came equipped with a Bendix-King KLN-90A navigator and a KFC 150 autopilot. Beginning with the 2000 model year, the model's designation changed to Ovation 2; look for a pair of Garmin GNS430s, a KFC 225, a WX-950 Stormscope and a two-blade prop. Factory options included built-in oxygen, propeller deicing, air conditioning and a TKS certified for known icing.

For the 2003 models, Mooney brought forth the Ovation 2 DX, featuring a standard Garmin 530/430 package, data linked weather capability, a KFC 225 and a KCS 55A HSI. For 2005, a GX version was offered, which included a Garmin G1000 glass panel. In 2006, the DX version was dropped and the G1000 became standard equipment. The Ovation 3, with its 310-HP IO-550, G1000 panel, Garmin GFC 700 autopilot and $469,000 average retail price came on the market in 2007.

MAINTENANCE

Owners also report few maintenance issues with the engine and airframe—aside from common ailments with TCM cylinders and valves—but can't say the same for all the avionics goodies the factory installed. One owner noted problems with both his Garmin 530 and 430; another reports his 530's screen

Accident Scan: Runway Prangs, Ugly IMC

Out of the 519 Mooney M20Rs built since 1994, 29 made the NTSB accident reports. Not unlike other models in the Mooney line, runway mishaps are a common accident scenario for the Ovation. Many of those prangs were the result of pilots improperly minding airspeed, runway length and wind conditions. Among the group were some impressive botched landings, including one M20R pilot that landed the airplane on the right side of the runway, then veered off and proceeded down a grass embankment and across a drainage ditch before smacking into a large cement box.

A go-around gone wrong had an Ovation strike the airport perimeter fence and a large rock, separating the left wing from the airplane and igniting a fire. Another Ovation piloted by a student—who admitted being too fast and touching down too far down the runway—lost directional control during the attempted go-around. This airplane ended up in a residential backyard, engulfed in flames.

Since the Ovation is a traveling machine, there were some ugly IMC accidents—some of which were painfully unnecessary. That was the case for one non-instrument-rated pilot who departed on an intended 1300-mile cross-country flight in low ceilings, limited visibility, rain and fog. There was no FAA record of the pilot obtaining a preflight weather briefing. Radar data indicated a right climbing turn to 2200 feet, then an abrupt maneuver followed by a rapid descent into a residential area. According to the NTSB, the pilot had no known instrument training and the airplane was 165 pounds overweight.

Another M20R collided with high voltage utility wires while in IMC after its instrument-rated pilot deviated from the controller's assigned heading and altitude. It ultimately impacted the ground in a spiral, spreading burning debris over a large area.

Inevitably, these traveling machines end up in icing conditions. One such encounter ended in a fatality after an ice-related engine failure. The airplane struck hilly terrain, bounced, went through a fence, and then hit trees and burst into flames.

We found one fatality report regarding a ferry pilot who launched on a transpacific flight but didn't make it far. According to the NTSB, the pilot failed to take care of one little detail: he didn't ensure that the airplane was loaded within its CG envelope. It was loaded so far aft that it had negative pitch stability, which resulted in loss of aircraft control during the initial climb.

Surely, the M20R accident reports suggest nothing that makes us believe the speedy airplane is unsafe—it just demands attention when close to and on the runway—and proper decision-making when flying in weather.

"burned up" in flight. None of that, of course, has anything to do with the airframe and Ovations appearing on the used market likely will have all those kinks worked out.

We spoke with Fred Ahles, president of Premier Aircraft Sales in Ft. Lauderdale, Florida, a long-time Mooney sales and service center regarding factory support now that production of finished aircraft has ceased. Ahles indicated that there are about 10 employees at Mooney and they are providing parts support to the field. He reported that his shop has had no problem obtaining parts. He also reported that of the dozens of different types of airplanes he's sold over the years, Mooney Ovation and Acclaim owners have been the happiest with their airplanes over time.

But problems have arisen, some of which were targeted by Airworthiness Directives (ADs). In one instance, the factory apparently omitted a reinforcing gusset in the aileron control links. An AD, 98-24-11, addresses that shortcoming by requiring 100-hour inspections for 41 copies of the M20R. Installing improved parts terminates the AD. Another issue arose with cracked exhaust systems, as embodied in AD 95-12-16. A repetitive inspection was called for, at least until improved parts could be installed per a factory retrofit kit. Air-conditioned Ovations were required to be equipped with a placard specifying the system's use during cruise operations alone, or owners were to disable the system entirely, under AD 99-11-07. That action responded to what the FAA called "dangerous levels of carbon monoxide during taxi, climb and descent operations."

Improper installation of the pitch trim actuating system—the entire tail moves for pitch trim—lead to a near loss of control accident when fasteners failed. Two ADs resulted, 2012-03-52 and 2012-05-09, requiring inspection for condition and proper placing of attachment hardware and Huck Bolts.

AD 2007-05-04 was issued to prevent the upper engine mounting hardware from losing torque, which could lead to engine mount failure. The AD responds to firewall insulation and upholstery being compressed between the fuselage tubular frame and the firewall at the upper left and upper right engine mount attach points.

Additional ADs issued against aftermarket cylinders from ECI, Hartzell propeller hubs and Bendix-King autopilots came up in our research.

OPERATING COSTS

Owners report the Ovation's operating costs are commensurate with this class of aircraft, with annual inspections falling into the $2000-$5000 range. Of course, surprises can always crop up and Mooneys are not immune. The aforementioned cylinders are one possibility; accessories like starter adapters are another.

Insurance is available and seems to be priced in line with other high-performance single-engine retract-

Ovation panel evolution from top-of-the-line round gauges (top) to Garmin G1000 (above).

ables. As always, some of the best deals can be had through type clubs. Training, also, is easy to obtain: The Mooney Safety Foundation, www.mapasafety.com, is heavily involved with type-specific flight and ground instruction. Flight training courses are held approximately five times per year at various locations throughout the United States, using instructors with many years and thousands of hours of Mooney experience, according to the association's Web site.

USER GROUPS/MODS

Perhaps more so than for any other marque, many Mooney owners can rightly be termed "maniacs." It's no surprise then that an excellent user group has sprung up, along with many knowledgeable maintenance and modification shops. The Mooney Aircraft Pilots Association, www.mooneypilots.com, is conveniently based near Mooney's Kerrville factory, having recently moved from San Antonio, Texas.

Modifications are available from a wide variety of sources for all models. Some, however, may not be approved for the Ovation, since earlier models are more numerous and the Ovation may already incorporate many items—a low-drag windshield, for example. In February 2006, Mooney began offering an upgrade of the Ovation (and M20S Eagle) to increase maximum horsepower to 310. According to Mooney, the mod resulted from work done by Midwest Mooney of Flora, Illinois, www.midwestmooney.com, and PowerLite LLC, a subsidiary of AvPower LLC, which the FAA blessed by awarding an STC. The mod is still available from Midwest Mooney.

In addition to Midwest Mooney, other mod shops include The Mooney Mart, www.mooneymart.com, and Lake Aero Styling and Repair, www.lasar.com. Precise Flight, www.preciseflight.com, offers its

Cleaning up and moving out; owners report taking the normally aspirated into the flight levels and cruise speeds of over 190 knots.

wing-mounted speed brakes for the Ovation to help slow it down. Meanwhile, LoPresti Speed Merchants, www.speedmods.com, will sell you its popular Boom Beam landing and recognition light system.

OWNER COMMENTS

I'm a great fan of the Mooney Ovation, graduating from a 1975 M20E I owned from 1996 to 2000. I've been flying my 2005 GX2 since it was ferried to Australia in 2006. Before that, I owned an earlier M20R that was ferried here in 2000. Having operated the M20R for over 13 years for both business and personal use, I believe the airframe and the IO-550-G engine combination is one the best in its class.

Flying here in Australia generally means long distances between refueling points—sometimes hours at a time over featureless, sparsely inhabited outback (desert). Speed, reliability and range are essential. Once away from cities, refueling stops can be problematic and prices can exceed $9.00 per gallon. Most of the time I fly at 8000 to 9000 feet, although occasionally I will operate in the flight levels to take advantage of tail winds and fuel economy or to avoid weather. The highest point in Australia is 7310 feet, so there are no imperatives to operate much above 10,000 feet.

I particularly like the normally aspirated IO-550-G because it is relatively uncomplicated and requires less maintenance than its turbocharged cousins. It will take you to FL200 when you need to be there. With almost 800 hours on my GX2, the only unscheduled maintenance has been to reseat an exhaust valve and a minor weld repair on the exhaust. The engine is comfortable to operate LOP, although my first Ovation wouldn't operate lean of peak. I also find my GX2 a little faster, possibly because of the switch to a Hartzell prop from a McCauley.

The Garmin G1000 glass cockpit was initially a challenge after round gauges, but now I would have difficulty with anything else. The S-Tec autopilot is okay, but nowhere nearly as smooth and accurate as the King in my earlier M20R.

From a service point of view, I've had little need to call Mooney, but when I have, they've been nothing but helpful and responsive. If I could convince them to start building airplanes again, I'd be first in the queue.

Gary McKernan
Via email

I have based my Ovation 2GX here in Denmark since I purchased it new in 2007. It is equipped with the G1000 panel and GFC 700 autopilot.

I've been extremely happy with the airplane because of its speed, range, high-altitude capability, known icing system and built-in oxygen—which make it the perfect airplane for long, high-altitude trips in Europe. It replaces an F33A Bonanza. I was happy with the Bonanza, but the Mooney Ovation is better for my needs as I can fly above most clouds in all seasons, which was not possible in the Bonanza.

Klaus Ostenfeld
Via email

We purchased an Ovation 2 for our company in August of 2011. We're the second owner. We fly the airplane between 250 and 350 hours per year, all over the U.S., in all types of weather, from our home base in eastern Texas. It has been an excellent long-haul airplane for us.

Bottom line, with the Ovation you can expect to cruise at a minimum of 170 knots between 7000 and 10,000 feet at 65 to 70 percent power. It is consistently 15-20 knots faster than the Cessna 210 we owned previously and 25 to 30 knots faster than the Turbo Lance we owned before the 210. Offsetting the speed advantage is the need to watch weight in the Ovation—there's lots of baggage space, but not the load-carrying ability. It's a two- to three-place airplane when carrying any kind of fuel.

With full tanks (90 gallons), the Ovation is a legitimate six-hour endurance machine—we normally see under 15 GPH fuel burns. A neat feature we frequently use are the wing fuel gauges that allow partial fueling to 60 gallons for four-hour endurance and a heavier cabin load.

You have to pay attention to line personnel fueling the airplane as they tend to overfill the tanks. The book calls for stopping at the base of a one-inch neck rather than up to the cap. If fueled above the base of the neck the result is a distinct fuel odor in the cabin until fuel is burned down to the proper level.

The Ovation likes to climb—it goes up nicely in a cruise climb—something our 210 and Turbo Lance didn't do. You can easily see 700 FPM at 140 knots indicated to over 10,000 feet. You do have to watch things when it's time to descend. The Mooney has speed brakes for a reason. With the KFC 225 and proper planning though, you can dial in a 200- or 300-FPM descent and pick up extra speed over the last 80 miles or so.

We felt the Mooney gave us more value for the money than a Piper, Cirrus or Bonanza. The only down-

side is the smaller cabin—the fewer inches in width and headroom are certainly noticeable. There are no good places for the charts in easy reach of the pilot.

You need to be limber to get in and out as compared to the 210 or even the Lance—but once in, it is generally comfortable. Anyone considering a Mooney certainly needs to fly one to see if the cabin is suitable. Both of our pilots are small, so it's not a problem for us.

Maintenance has been very good—plus Mooney did a good job in design in many areas such as the landing gear which is superior to Cessna or Piper. However, it's not perfect—replacing one circuit breaker requires removal of rivets in the airframe skin. Replacing a wire to the dimmer switch, where there is hardly any room to maneuver, takes over an hour. Those sorts of things should have been caught prior to production.

Everything you have heard about a Mooney in flight is true. It is solid in roll, stable when trimmed and holding proper speed on final is important. It is difficult to scrub off additional speed and it will float.

The airplane gets a bum rap because it has a more abrupt stall break than a Cessna, so pilots tend to fly final too fast because they're worried about stalling and then use up a lot of pavement. It can use short fields, but it takes practice and finesse to land well. If you need to use short or grass fields regularly, a 210 is a better choice, however.

The Mooney has proven to be the best airplane for us as compared to our earlier 210 and Turbo Lance—and boy, does it get places in a hurry. With the speed, be ready for a high workload and the need for fast thinking on arrival. Controllers don't seem to recognize this, and it often takes some negotiating to get a descent in time to set up outside the marker.

Ted Gribble
Via email

Having purchased one of the first two glass-panel Ovations and having it upgraded to include the GFC Garmin 700 auto interface, as well as the Ovation 3 modification, I feel I am in a good position to comment.

Insuring a high-performance retractable with no experience can be difficult. Using Falcon Insurance and working closely with MAPA's Safety Foundation, I had no problem obtaining full insurance. I immediately took intensive training. Insurance was always reasonable, but I might have had problems had I purchased a competitive aircraft.

My first annual was $1500, the second was $2500 and the last one was $4000, but it involved replacing a cylinder (burned valve) covered under warranty as well as some discretionary improvements. A reasonable estimate would be between $2000 and $2500.

Gary Gongola
Menomonee Falls, Wisconsin

In my M20R, I figure on 180 knots true on 11.7 GPH. I fly lean of peak almost all the time. The engine still has compressions of 72–76 over 80 PSI, and it is down about two quarts of oil by 30 to 35 hours.

The Ovation looks great on the ground and in the air but, better than that, the performance is outstanding. The ride is solid and comfortable. Controls are on the heavy side, especially in roll, but pitch is somewhat sensitive.

The biggest drawback, other than useful load, is headroom. On the older Ovations, the panel is high and difficult for a shorter person to see over—on the newer models, it was lowered about 1.7 inches, which made a big difference. It's awkward to get in and out, but once in, it's comfortable.

Compared with the 201s, the Ovation is harder to land well consistently. I strongly recommend the MAPA proficiency course for anyone buying one for the first time.

The Ovation is a fast, comfortable, good-looking hot rod. It is extremely efficient, a nice feature in this time of sky-high fuel prices. I sometimes have been asked if I wouldn't really like to have a twin. No, thank you. I already have the performance at much lower cost in fuel, maintenance and insurance. If I needed a twin, I would be out of aviation in a heartbeat.

Ken Summer
Avon Lake, Ohio

The Aviation Consumer

Life Rafts

(continued from page 11)

rafts trace their roots back decades. They lack the attributes now commonly accepted as desirable, and included in the latest SAE AS1356 life raft standard, such as ballast and effective entry aids. In our opinion, their stick-built canopies have many serious drawbacks. We don't recommend those rafts.

EAM entered the modern era with their T4S and T4AS—approved life rafts that incorporate the features expected in a modern design. The standard, automatically inflating floor of the T4S is a definite advantage for this single-tube life raft. These life rafts are worth a look, but list price is expensive when compared with Winslow's functionally equivalent, non-approved life rafts.

When EAM provided list prices to us, they asked that we note that their life rafts are "competitively priced. Exact quotes available upon request." In essence, they told us they will consider adjusting the price to be competitive with comparable rafts.

REVERE SUPPLY CO.

Revere's offerings are the only ones reviewed here utilizing polyurethane-coated fabric (all the others are made from traditional neoprene-coated FAA-approved life raft fabric).

If low price and reasonably low weight are key for you, the Aero Compact seems the best buy. Its optional canopy is better in many respects than Survival Products' teepee. The included standard ballast is an advantage that may mitigate the nearly useless boarding aids.

Revere's Aero Elite offers a good combination of features and reasonable cost, but at a significant weight penalty. It is vacuum packed, which allows a three-year repack cycle.

SURVIVAL PRODUCTS, INC.

If light weight is your key requirement, these are your rafts, albeit they have few other qualities, in our opinion. The approved version is only slightly better—the minimal ballast is better than nothing, but it still has inadequate entry aids, making it deficient, in our opinion. Beyond light weight, we find no compelling reason to select these rafts.

WINSLOW LIFERAFT CO.

Winslow's extended feature sets and multiple options do not come cheap, but the company has retained its reputation for premium quality rafts. We have long found it attentive to customer needs with a wide range of standard offerings and many options that allow you to tailor the life raft to your particular requirements and budget. It offers a vacuum pack option for extended service intervals. Winslow life rafts can be purchased from dealers, but to get your selection of specific options, we recommend contacting Winslow.

Believing that redundancy is a key criterion, we'd consider the dual-cell RescueRaft2 as our minimum specification single-tube life raft. Alternatively, you can save a few hundred dollars and add the optional inflatable floor ($200-$250) and interior boarding ladder ($33) to the base RescueRaft. Adding a few optional ballast bags ($48) and a Repair Kit ($18) to either version would complete a very nice, basic life raft with all the essential features.

The Ultra-Light Offshore is effectively the same as its FAA-approved Ultra-Light FA-AV(SA) that along with the Tri-Arch version (FA-AV(UL)) are supplied as standard equipment on the majority of new business jets, at nearly half the cost. All it lacks is the TSO certificate. There are no substantive differences in manufacture, materials or essential features, so it represents a relative bargain. For the weight conscious, it weighs in 18 percent less than the comparable single-tube Island Flyer, albeit at an 18 percent higher cost. However, you also get the redundancy of dual buoyancy tubes.

For any significant overwater adventure, the Ultra-Light Offshore is our pick of the life rafts reviewed here.

FEEDBACK WANTED

BEECH 36

For the October 2013 issue of *Aviation Consumer,* our Used Aircraft Guide will be on the Beech 36 series, the stretched, six-place Bonanza. We want to know what it's like to own these planes, how much they cost to operate, maintain and insure and what they're like to fly. If you'd like your airplane to appear in the magazine, send us any photographs you'd care to share. We accept digital photos e-mailed to the address below. We welcome information on mods, support organizations or any other pertinent comments. Not an owner? We still want to hear about your experience flying the Beech 36. Please send correspondence on the Beechcraft 36 series by August 1, 2013, to:

Aviation Consumer
e-mail at:
ConsumerEditor@hotmail.com