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## FIRST WORD

### SANDEL'S FIVE DAY GLASS PANEL

Can shops really retrofit Sandel's new Avilon integrated flight deck, which includes an advanced autopilot—in a King Air—in five working days? Gerry Block at Sandel Avionics believes so. I'm skeptical because it's challenging to install a single-screen Aspen PFD in a Skyhawk in one shop week, especially for smaller shops. Tearing down (and building back up) a King Air isn't easier. I was once on a team that retrofitted a Garmin MFD, TAWS-B and a satellite phone in an old E90 and it took the better part of three weeks, including FAA paperwork, flight testing and a DER signoff.

Sandel's new Avilon, with its prefab design, hints that the labor effort for large projects could be changing for the better. You don't have to own a turboprop to appreciate the benefits of getting the project off the hangar floor quickly. As we report in the aircraft appraisal article on page 8 of this issue, the hit you'll take on the labor portion of an avionics project when you sell is enough to make you cry.

The labor-gobbling realities of most upgrades means shops are bogged down with repairing existing old wiring harnesses (spaghetti, as we called it in the shop), building new ones, plus the gutting of the cabin to gain access and lay it all in. After all that, it's time to put it all back together. Sandel attempts to tame that dragon, supplying the Avilon suite mostly assembled, with prefabricated wiring harnesses wrapped in protective sheathing and even sending new drop-in replacement instrument panels. Rather than large remote mounted processors, the Avilon architecture is made of small LRUs, or line replaceable units running across a common databus. That's one configuration in the photo above, racked behind the pilots PFD.

LRUs aren't new and they've been the backbone of Garmin's G1000 and G500/600 integrated avionics for years, often scattered about the airframe. And that's where the intense labor comes into play—running harnesses here and there—while relocating existing systems to accommodate large AHRS processors, air data computers and other accessories. But Sandel designed its weight-saving LRUs to be self-contained in one small area and easily accessible by folding down a hinged door on one of the instrument panels, or containing the LRUs in one central location in an existing avionics bay.

Sandel designed its network to work with other brands of vintage avionics, but that isn't necessarily a time saver, since shops will have to work with existing wiring. The Avilon's autopilot utilizes the existing autopilot servos, saving the effort of pulling the old servos and rigging new ones deep within the airframe. The system is also compatible with Garmin's GWX-series weather radars (and others), since Garmin utilizes an Arinc bus for interconnection with the display and AHARS pick-off. Software compatibility remains a concern when mixing brands.

There is growing competition in the turboprop avionics retrofit market, with Sandel boldly advertised a fly-away price of \$175,000 (the system is still in the STC process, so it's still early to tell just how realistic that price is.) What is realistic is the \$300,000 fly-away price for Garmin's G1000 King Air retrofit. Elliott Aviation's Mark Wilken told me the G1000 doesn't sell itself. In other words, at this price point, the sales department works hard. His shop completes G1000 King Air retrofits in three weeks, but all harnesses are ready before the aircraft even arrives, plus the aircraft is crewed by large teams in two shifts. Like me, Wilken thinks Sandel is underestimating the time required for reassembly, paperwork, configuration and testing. Even BendixKing told me it might require 1200 hours of labor to install its AeroVue glass suite (still in certification) in a King Air. For these reasons, all eyes are on Sandel for an easier way.—Larry Anglisano



## WHAT'S SO BAD ABOUT VACUUM SYSTEMS?

You guys produce a great magazine—keep up the good work. But, regarding your December 2015 article about switching to electronic attitude gyros, you act like maintaining a vacuum system is akin to electrics in an old British sports car. Now the FAA is joining the bandwagon of bashing vacuum systems. Vacuum systems are not that bad.

I have flown my Beechcraft Debonair 3900 hours over 20 years in all kinds of weather, including approaches to minimums and in icing and thunderstorms. My vacuum system has never failed. I replace the wet pump every time I replace the engine, which the last time was at 2250 hours. My gyros are reliable, probably because I fly frequently. My vacuum attitude gyro failed once right after I bought the plane probably because the last owner did not fly much. My vacuum directional gyro was replaced once due to excessive precession and will need to be replaced again soon. My RC Allen backup electric attitude gyro also failed once. New vacuum gyros cost \$800 new, on average, or \$500 for overhauled ones. Electronic attitude gyros cost \$5000 to \$8000. I'll keep my vacuum system.

Mike McNamara  
via email

*Perhaps we were a bit too hard on the venerable instrument vacuum system, Mike. But not all owners enjoy the favorable reliability you've experienced in your Debonair. As you noted (in a follow-up discussion), you don't have an attitude-based autopilot like the BendixKing KFC-series, as one example. The vacuum-driven attitude gyros for these autopilots are shockingly expensive to overhaul—far more than the best-case \$500 overhaul you describe. Electronic models promise to keep these long-term costs under control. But as we noted in the article, the BendixKing K1300 is*

*the only electronic attitude gyro with autopilot pickoff, so the problem isn't solved.*

## LYCOMING FUEL PUMPS

I am writing to give you a heads up about a problem with new Lycoming fuel pumps, which has turned into a Lycoming mandatory service bulletin. The pump that came installed on a factory remanufactured engine for our Mooney M20J initially wept a couple of drips of fuel when the engine was shut down, but by 25 hours of operation it was pumping 1 GPH out the overflow tube.

When I asked AirPower (the source for our engine) for a warranty replacement, I was told it would be four to six weeks because so many pumps were defective. I was given permission to alternatively buy a Tempest fuel pump so we could get the aircraft back in the air. We returned the defective pump and the new one to AirPower, but immediately received invoices from AirPower requesting \$421.16 for the replacement fuel pump sent by Lycoming.

I submitted to AirPower the labor bill for swapping the pump, the cost of the Tempest replacement and the freight charges. AirPower says it takes six weeks to resolving warranty claims, but I considered myself lucky to be reimbursed anything for my out-of-pocket expenses in 30 days.

Paul Lisowski  
via email

*Lycoming's mandatory service bulletin 621A states it will pay (through an authorized distributor) for reimbursement of the replacement pump, freight charges and no more than 1.5 hours of removal and reinstallation labor. If a genuine Lycoming pump is not available, it allows the substitution of an FAA and PMA-approved replacement. Sounds like you did everything right.*

*Lycoming says roughly 1800 pumps are affected and is caught up on replacements. AirPower's Michelle Barnes told us she isn't aware of any backlog in the*



*processing of claims and has a dedicated warranty department to handle them. She said while every case is different, AirPower will coordinate the swap, even without having the failed pump in hand. Warranty consideration is available until September 2016, which is one year after the release of the service bulletin.*

## GARMIN PILOT APPROACH

I have the Garmin Pilot app and questioned Garmin customer service about it not including initial approach procedures in the flight plan feature set (Garmin did add SIDs and STARs to flight plans).

Garmin customer service replied that the reason IAPs have not been added to flight plans is because the FAA is so strict on IFR-certified devices. It acknowledged that ForeFlight and other app makers have been getting away with IAPs.

This response is baffling because neither the Pilot app or the iPad on which it runs on are certified devices, so they would not be under the regulatory jurisdiction of the FAA.

Robert Josephs  
Chicago, Illinois

*Should you crash, anything in the aircraft could be under FAA and NTSB jurisdiction, but we get your point. We asked Garmin's Jessica Koss about the data. "Adding instrument procedure waypoints to a flight plan is on Garmin's road map as it continues to expand the Garmin Pilot interface," she said.*

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# Aircraft Appraisals: Field Research is Critical

*Valuations based solely on price publications can lead to bogus price setting. Creditable appraisal reports accurately account for refurbishment and mods.*

by Michael Simmons

**W**hat is the average buyer, banker or layperson to do if they need to know the value of a specific aircraft? Many turn to numbers reported in price publications or the asking prices on aircraft sales websites, believing the information is accurate, but this can be an expensive mistake.

The growing refurbishment trend for aging airframes, plus the high prices of avionics retrofits, makes the valuation process even more difficult. That's why a formal appraisal report that's skillfully prepared by a trained and experienced appraiser can yield more accurate figures than back-of-the-envelope guesstimates.

In this article, I'll offer an insider's look at the aircraft appraisal market and discuss how the pros determine the value of used aircraft. Additionally, I'll show how full refurbishment labor and avionics retrofits impact the overall value of the aircraft.

## PRICE PUBLICATIONS

Several years ago, I had a contentious discussion with a broker selling an aircraft that I appraised for a

banking client. The broker challenged me because the appraisal results came in about 20 percent less than the negotiated price.

The broker suggested I didn't know what I was doing and said he was an expert at using a particular pricing publication. If I had only used the publication properly, he argued, the deal would have worked out fine. He went on about all the equipment that had been added to the aircraft as part of a recent avionics upgrade, and as he identified each item I checked to be sure I included it in my analysis. He simply added the cost of all this equipment to the specified average retail value in order to arrive at his final opinion of the aircraft value. Turns out, this was above the negotiated price—indicating that the buyer was getting a great deal.

When I asked if he accounted for the removed avionics equipment in his analysis, the silence on the other end of the conversation was deafening. As a so-called expert, he should know that the average retail value used as the starting point in

*A non-flying spouse was certain the old Apache in the field was in prime condition, but an appraisal inspection quickly proved otherwise.*

the publication is nothing more than a mathematical model containing a specific configuration of avionics, as well as other parameters. Without making any adjustment for this original configuration, he effectively equipped this single-engine piston aircraft with two autopilots, four navcomms and two DMEs. That surely wasn't the subject aircraft.

I then asked him about the missing logbook I noted during my field research and how he or the price publication handled those situations. His response was that the missing logbook didn't matter. I explained that missing logbooks and maintenance entries did matter, as roughly 30 percent of the aircraft's life could not be accounted for. This made it impossible to verify the total airframe time, any previous damage history and other issues the aircraft may have been involved with during this period.

The market places a financial penalty on aircraft in these types of predicaments, but price publications don't address these and other unique situations. The sales broker certainly didn't, and it was clear he was interested in setting a value that promoted a certain narrative. My objective as a professional aircraft appraiser was in reporting a creditable and reliable opinion of value—two

## CHECKLIST



NAAA-backed appraisers can be your ally when working with banks to fund refurb projects.



Pricing publications are only a starting reference. Mods and damage need closer evaluation.



Sellers lose big time on labor-intensive avionics upgrades. The market doesn't credit labor costs.

very different objectives. I continued to explain that I was using a current database that was based on actual selling prices of similar aircraft. The database was developed for the sole purpose of appraising aircraft, versus numbers in a book that are based on information provided by subscribers.

He offered no compelling argument that my research and resulting opinion of value were incorrect, so my report would stand as written. Although this discussion occurred several years ago and involved a single-engine piston aircraft, it could have easily occurred yesterday and might have involved a business jet worth millions of dollars.

While offering some resources, trade publications are seldom much help when appraising aircraft because the asking prices vary wildly. The same can be said for aircraft sales websites.

Many believe that publications or websites are the answer when the need arises to discuss market value, but publications are in the publishing business (versus the aircraft appraisal business) and generate their revenues from subscriptions. The small print in their disclaimer clearly states that the publication is meant to be a general guide only and should not be used to appraise a specific aircraft. This is due to the many variables involved, but the data tends to be used—or misused—for that purpose anyway.

There is no indication the publication data tracks anything more than what someone submitted to the publisher and no indication that the data has been validated in any way. Further, I have not found any consistency in the strategies behind the establishment of asking prices—other than finding the highest priced aircraft for that year model and then adding a percentage or two on top of that. In many cases, the advertised aircraft are simply priced excessively for what they are in the current market. There are also issues not addressed in value publications, such as missing logbooks and maintenance entries, which some evaluators tend to ignore. To the average buyer and seller, these errors wouldn't be noticeable, but to the professional appraiser the errors can have a significant impact on the final opinion of value. This is one reason there are



*You want to borrow how much money for that refurbished 1980 Saratoga with a \$100,000 glass panel? Professionally prepared appraisal reports are becoming essential in the growing refurbishment market.*



vast differences between the results of a professional appraiser and an evaluator. There is a difference.

Worth noting is aircraft that sell the fastest are generally those which are priced more in line with the current market. There are exceptions of course (warbirds and classics, to name a couple), but piston aircraft that are priced correctly tend to sell in about 90 to 120 days. Still, when I am acting as a buyer's agent, I can't ignore the advertised aircraft, but there are better valuation options out there and this is what buyers ask me to find. Additionally, I can quickly determine from the advertised aircraft which ones are priced within reason or may have undisclosed damage, for example.

Unlike real estate, where an appraiser might go down to the local courthouse to see what a similar piece of property sold for, there is no such resource for aircraft. Even if there were, the selling price alone would be somewhat meaningless

without context. In other words, without a detailed inspection, it would be impossible to know the specific attributes of the aircraft in question with any certainty. Moreover, these attributes could have a major impact on the selling price—or the ability to get an improvement loan for the aircraft.

The other problem is the aircraft appraisal industry is unregulated, which means that anyone can claim to be an aircraft appraiser without any background, experience, knowledge or training. Surprisingly, there are no requirements to physically examine the aircraft or any logbooks when slapping a value on it.

### **THE NAAA STANDARD**

Back in the 1970s, several bankers questioned the accuracy and detail of the aircraft value publication of the time and needed something more detailed and accurate when financing and leasing aircraft. The result was an aircraft valuation database, along with a process that collected actual selling prices of aircraft from creditable and reliable sources, which also included specific details about the



*It's a mistake to simply add the shop's total invoice to the value of an aircraft when accounting for major aftermarket mods like extended range fuel tanks, left, photo. Labor costs aren't credited.*

aircraft itself. It's important to note that these details were obtained from physically examining the aircraft and its maintenance records.

The details were compiled in a comprehensive report, which included a calculation page and the appraiser's signature. Over the years, the gentleman who developed this system turned it into a national service organization and began certifying members to be aircraft appraisers long before there was any type of certification process for the appraisal industry.

Around 1980, the NAAA (National Aircraft Appraisal Association) was born and while it has undergone a number of changes since then, this organization still continues to collect and track actual selling prices of aircraft as they related to specific configurations—the only organization to do so.

The NAAA gets its data from a number of sources, including sales information from the banking industry, NAAA members, trusted industry sources and extensive market research. With roughly 200-plus members across the U.S. and around the world, the NAAA performs the majority of appraisal reports compared to other organizations, meaning the association collects a tremendous amount of data every month.

Today's database supports thousands of makes and models of fixed-wing and rotary aircraft over a number of years, along with an extensive set of avionics equipment values. All data is updated on a monthly basis for NAAA members (versus quarterly

releases for price publications). In addition, the NAAA is also the only organization to require its members to physically examine each aircraft and its maintenance logbooks whenever an aircraft appraisal is needed. This requirement is unique to this industry, and field research is critical when the need arises to support the final opinion of value.

The NAAA found out long ago that banks have no reason to inflate or deflate selling prices, plus it has an unbiased, trained professional gathering key data points, versus random persons submitting a few key pieces of data that cannot be validated, which might be the case with price value guides. As with value publications, there are other proprietary parts and sources to the NAAA process, but the NAAA data was put through rigorous tests when the market took some dramatic turns over the years, performing rather well compared to the value guides.

It's important to point out that the NAAA process of appraising aircraft is fundamentally different from others, which tends to create confusion. Essentially, NAAA members start each appraisal project with a clean-sheet approach and electronically build the aircraft based on the findings of the field research. This is why field visits are a critical part of the process.

Other evaluators use websites or publications, which employ a very different starting point. The model being used in that instance uses parameters such as mid-time engines, average airframe time and the

aircraft being equipped as it left the factory. Newer aircraft aside, few aircraft meet that criteria today, so the evaluator must make adjustments to the model—a point in the process where errors can and do occur—because those adjustments impact the final result. Using the publication properly would take quite a bit of effort on the part of the evaluator to complete in a creditable manner, but many evaluators simply don't put that much effort into the exercise and it clearly shows in their analysis.

## REFURB REALITIES

The recent aircraft refurbishment trend is one area of particular interest because banks are routinely asked to provide financing for these projects, and many don't understand how these improvements impact the overall market value once the work is completed. Owners and buyers also struggle with this same issue of nailing the aircraft's value after major improvements.

Other than airworthiness and certification matters, the aircraft refurbishment industry is also unregulated and when we are discussing the airframe itself (versus just the avionics equipment), the term "refurbished" can take on any number of activities, along with various quality factors—all of which can impact the aircraft's market value.

The unfortunate reality for any refurbishment shop choosing to work on a specific aircraft is that there are a number of factors that can't be changed no matter how much material and workmanship is put into the effort. These factors include the year, make and model of the aircraft itself, the total time of the airframe, the aircraft's previous damage history, plus its maintenance history and related records.

For a number of evaluators, the easy choice is to look at the shop's invoice or the value publication's stated "add for" notation and simply

add this amount to the publication starting point. This approach would be incorrect and would overvalue the aircraft—an attempt to set, versus report its value. In these situations, professional appraisers have to separate the maintenance-related efforts from the enhancement efforts and consider the quality of workmanship in the evaluation of the aircraft.

For example, a new paint job or interior may look good from a distance, but if the quality of workmanship is poor, these attributes will not provide a considerable increase in the overall value of the aircraft, regardless of what shop may have actually completed the work or how much someone paid for the effort.

Another good example includes the mods involving engines (replacement of the stock engine) because simply adding the price of the mod stated in the price publication would generally include the engine value as well. The proper adjustment would be to mathematically remove the stock engine from the aircraft and then adjust for the new engine, based on the type and time since overhaul. Without making this type of adjustment, the evaluator has effectively doubled the number of engines on the aircraft.

Avionics upgrades are also an area owners wrestle with, especially in light of the upcoming ADS-B requirements. Simply adding the new list prices for the equipment being installed, along with all the related labor, would be incorrect and would overvalue the aircraft. For the professional appraiser, it becomes a question of what is presently in the aircraft (if the upgrade has been completed) or what is coming out versus what is being installed (if the upgrade is being planned). The cost of labor to install the new equipment is generally irrelevant because the market provides no credit for labor. Once anything is permanently installed in the panel, it is considered used. The fact that the equipment was new X-number of years ago is also irrelevant.

The question to be answered is: What is the equipment presently worth today? In extreme cases, I have observed the aircraft's market value actually decrease after an avionics upgrade and the reason was pretty straightforward. It was a single-box



upgrade where one piece of new avionics equipment replaced a number of other older ones. The new equipment certainly made the aircraft more marketable and functional, but the older equipment had value too, and the overall difference (what came out versus what was installed) was negative.

The important point to consider is understanding what the upgrade path looks like—what is being installed and what is being removed—to get a better sense of the outcome. To understand the overall market value of the aircraft once the project is completed really requires the services of a professional appraiser that knows the avionics market and is familiar with the airframe in which it is installed.

## MARKET VALUE

At this point you are probably thinking that the problem is solved and the only thing anyone needs to do is hire an NAAA appraiser to understand the aircraft's market value. Not exactly.

Market value is the price that a knowledgeable and willing buyer/seller will agree on under normal market conditions, with neither party being compelled to act. This is an important distinction because two parties can agree on a number that has nothing to do with market value. There are individuals such as brokers, dealers and bankers who really do not want to know the market value because it will kill the deal, the seller will lose money (could have sold it for one amount, but now has to take another) or impact the bank's

*Appraising a warbird like that sparkling P-51 above is time-consuming and requires an appraiser with additional training and expertise. Price publications generally won't account for the quality of restorations.*

ability to finance the deal. Brokers and dealers are not bad people, but face it—their objective is to get as much money as they can for the aircraft. This is not the objective of the unbiased neutral appraiser.

In my view, an NAAA appraiser is the only person in the transaction who can discuss the aircraft's market value in an impartial manner. Everyone else has a financial bias to some degree.

The term market value, used by professional appraisers, requires three conditions to be present. The first is a willing and knowledgeable buyer and seller. The second involves normal market conditions and the last condition, as stated, is that neither party is being compelled to act. If any one of these conditions is not present, then we are no longer talking about market value. In this regard, some individuals have turned the manipulation of these conditions into an art form for obvious reasons.

Think about the salesperson who said "I had someone looking at that very aircraft just the other day."

Although the statement may be true, the communication of this comment is an effort to put pressure on the buyer, thereby changing one

## AVIONICS UPGRADES: THROWAWAY LABOR

The sobering reality of major avionics upgrades is the financial hit you'll take when the aircraft gets into the hands of a professional appraiser. It sure is tempting to simply tack on the avionics shop's total invoice to the average retail price of the aircraft. Sorry for the buzzkill, but it doesn't work that way. That's because an appraisal doesn't factor in labor costs when considering the value of the upgraded avionics. And that labor will likely be substantial. It used to be that the list price of an avionics component might represent the installed price, but not so much these days given the teardown and interface that's required.

Let's consider a new IFR package for a 1981 Mooney M20J, equipped mostly as it left the factory with King Silver Crown avionics, including a KCS55A HSI, dual KX155 navcomms, KT76A transponder and a KMA24 audio panel. I got a sight-unseen quote for the installation of a dual-screen Aspen PFD with synthetic vision and autopilot



gyro emulator, a Garmin GTN750 navigator, GMA350C audio system, GTX327 transponder with new encoder, a GDL88 ADS-B system and EDM800 engine monitor. The fly-away price was \$63,350.

The average retail price of the aircraft with a mid-time engine and airframe is around \$75,000. An appraisal of this aircraft's parameters after the avionics retrofit will likely yield a value of around \$114,700—not \$138,400, which in a perfect world would include 100 percent of the price paid for avionics. Instead, the avionics portion would be around \$54,000, or the

equivalent of throwing away \$9,400 worth of shop labor (or two weeks installation effort—the amount of time it would likely take to complete the project).

Many shops don't like to break out labor and equipment costs, reasoning that it's simply a numbers game. But should you sell the airplane, you might want to know how much of its \$100-per-hour labor you'll throw away.

—Larry Anglisano

or more of the conditions, which would impact the perception of market value.

### NO FREE LUNCH

Defending an appraisal report containing unpopular results is something the professional appraiser runs into routinely. I remind banking clients that they may not like the results of the report, but they can trust it and I have no issue defending my findings. Evaluators have very few of these challenges. After all, they are providing a number that everyone wants or likes.

On the other hand, there are a number of individuals who have a keen interest in knowing the market value of the aircraft they are getting ready to purchase or finance, or when there is a legal question. Think diminished value from a damage event, for example. Who should these people contact, what should they expect and when should the appraiser be engaged?

The fundamental expectation anyone should have when hiring a professional aircraft appraiser is that they will physically examine the aircraft along with its records and provide a signed report of their findings. Anything less speaks to the professionalism of the appraiser and

their approach to the project. Most NAAA members are found through the association's appraiser finder tool on the NAAA website ([www.plane-values.com](http://www.plane-values.com)) and this would be an excellent place to start.

My advice is to work with an appraiser before negotiating any purchase price. Knowledge is powerful and in situations where I have helped clients in the purchase of their aircraft as an agent (versus brokers who are paid a commission based on the selling price of the aircraft), knowing the estimated value based only on the information in the ad determines whether or not a field visit is in order, along with attributes that may not be included in the ad.

The results of the appraisal report, which involves a field visit along with related research, helps determine if an offer should be extended and for how much. It may include specific issues to be addressed in the purchase agreement and prebuy inspection.

The appraisal report also makes the financing proceed much smoother and there are generally fewer surprises if the seller has been forthcoming in their information. If the seller has not represented the aircraft honestly, this is revealed very early in the process. Knowing the aircraft's

value as early as practical can save clients from unnecessary travel, wasted prebuy inspections or overpaying for the aircraft in general.

It's important to recognize that there is no free lunch. Hiring a professional will cost much more than \$25, or the typical cost of a web-based analysis. The appraisal fee structure should be based on the type of aircraft under consideration (piston single versus business jet, as an example). It may also depend on the appraisal problem to be solved (legal proceedings, high time aircraft or donations), the amount of research needed, plus travel-related expenses.

Some believe that the price paid for the appraisal cannot be recovered in any savings. This may be true on the very low end of the scale, but there is also the cost avoidance of making an uninformed decision that should be factored into the equation. Remember, market value involves a knowledgeable buyer. Bad decisions can be far more expensive than the price paid for the appraisal.

*Michael Simmons is a senior certified aircraft appraiser, NAAA trainer and the president of Plane Data, Inc. He flies a Cessna Cardinal based in North Carolina.*

# Lightspeed Tango: Wireless ANR

*Lightspeed's new Tango wireless headset isn't the first of its kind, but it's the most advanced. A smaller interface module could make it better.*

by Larry Anglisano

**W**hen we evaluated the EQ-Link wireless aviation headset a couple of years ago, we struggled to find a \$1000 reason to invest in its cordless design, especially since it didn't have the comfort of even mid-priced traditional models. So as the industry marvels at Lightspeed Aviation's recently introduced \$800 Tango wireless ANR model, we still wonder what—if any—problem this technology solves. Moreover, what problems might a wireless headset create?

To find out, we ordered the new Tango and put it through the paces in a few different aircraft. Overall, we're pleased with its performance, value and the technological progress it represents, but have a few nits to pick about its user interface.

## BUSY FEATURE SET

The price to pay for a wireless interface is more user controls, which includes an 8- by 2-inch remote control module wrapped in a high-quality nylon sleeve. It has traditional GA (dual plugs) audio cables well-protected in anti-chafe sheathing. The module houses the transceiver, its own power supply and battery, mode annunciation, plus a Bluetooth control and an auxiliary input jack.

We'll be blunt—the thing is big. But, since the module plugs into

*We're impressed with the Tango's build quality and overall comfort, although the headset is notably heavier than a Bose A20, and even the company's Zulu series.*

audio jacks just as a traditional headset does, Lightspeed smartly designed the module with enough cable to stash in a map pocket. No map pocket? You'll need to get creative and mount it somewhere. That shouldn't be too difficult since it's designed with multiple mounting points. We used the system in a pocketless Piper Tomahawk and found no place to stash it other than under a thigh. That's hardly practical.

If your head is accustomed to a lighter Bose A20 or even Lightspeed's 14-ounce Zulu 2, the 16-ounce wireless Tango might feel heavy and it's something we noticed immediately. That's not to say the Tango is uncomfortable—its 10-inch head and ear padding is generous—but there's a comfort price to pay for more weight.

It's the added electronics and battery power supply responsible for the weight gain. A 3.7-volt lithium ion (the same type used in the wireless control module) plugs into the left earcup. It's maintained through an onboard micro USB charging port, allowing for roughly 12 hours of battery endurance when at full capacity.

The batteries can be charged to 75 percent capacity in less than an hour, and to 100 percent capacity in two hours. The headset battery and charging port are accessed by a seemingly fragile hinged access door on the earcup, which we are sure to

## CHECKLIST



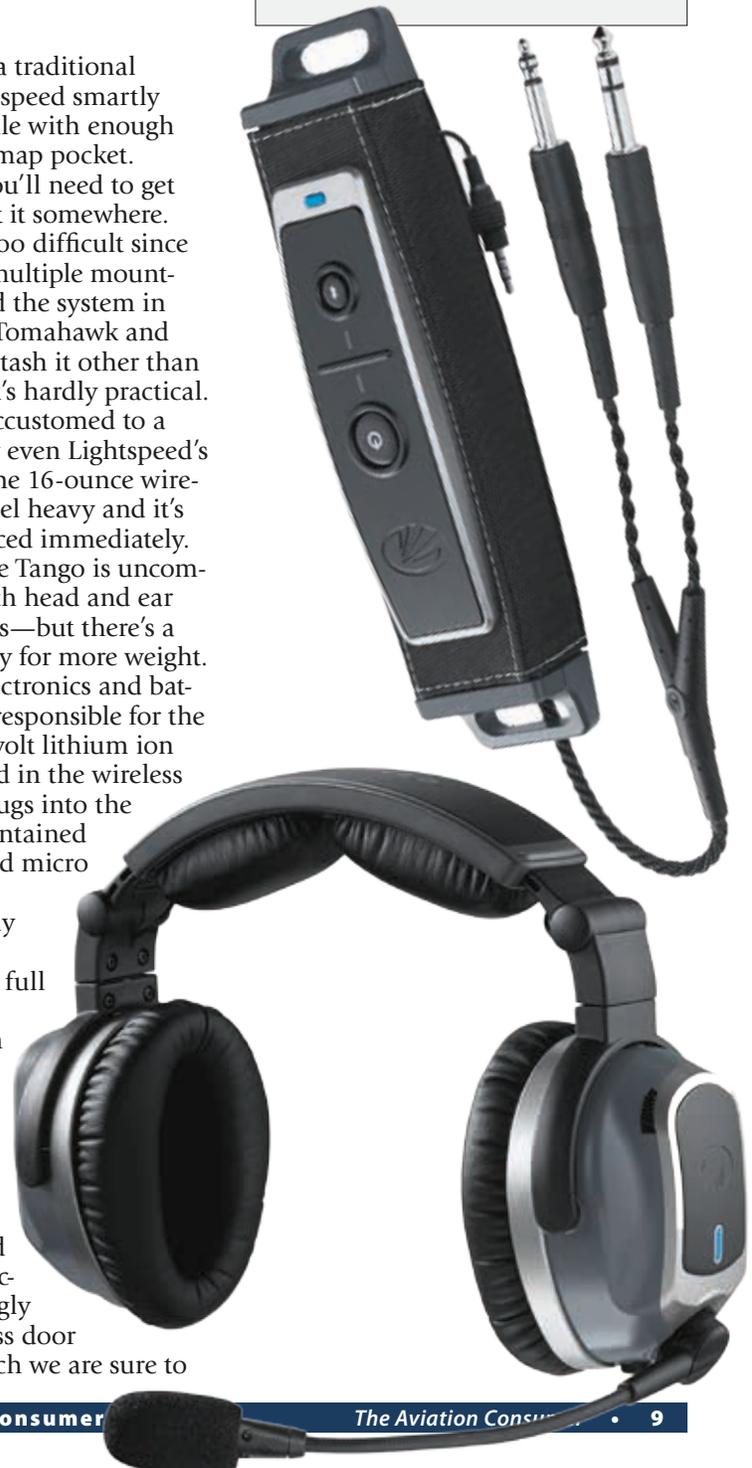
In Lightspeed tradition, the set has good fit, finish and audio quality.



Do wireless headsets solve an \$800 problem? Perhaps for aerobatics and stand-up cabins they do.



If you don't have a map pocket, you need to find a spot for the big control module.





*Wireless freedom means you can wear the headset outside of the aircraft, as we did when listening to the ATIS when pre-flighting, top photo. Once inside, the wireless control module shows its size, middle. The module and headset use the same model lithium ion battery, bottom. Extra batteries are \$35 each.*



is located on the left ear cup and we wish it were larger for use with gloves. The green LED on the remote module flashes once when power is supplied and the Lightspeed Link automatically pairs it with the headset. We like the design of the volume control on the right earcup. It's a large square rocker panel with up and down action, making for easy volume tweaks by tapping it. We also like the wide range of volume adjustments. Between it and the volume control on the aircraft intercom, you should be able to find the absolute perfect phones volume level.

To turn the system off, press and hold the power button on the headset until the green power LED turns off and you hear the power-down tone. The system automatically powers down after five minutes under quiet conditions, a mode which can also be disabled.

The Tango is available in a version with a LEMO interface for single-plug ship's power, which is the same plug as other Lightspeed and Bose models. The set is also available with a U-174 helicopter plug. To change any of these configurations from

the supplied dual GA plugs, Lightspeed said the module will need to be swapped out, but pricing wasn't available as we go to press.

## MYSTERY FREQUENCY

Oddly, Lightspeed wouldn't tell us on which frequency the Tango operates, citing proprietary engineering reasons. It did say that in the development phase, neither Bluetooth or Wi-Fi proved to be a reliable communication stream because of issues with the delay it caused in sidetone operation. Sidetone is the sound of your own voice you hear in the headphones while you're speaking.

The Link button inside the module is used to establish the wireless link between it and the headset, but only needs to be used once for initial pairing. A blinking red LED indicates that pairing has not been established, while a solid red annunciator indicates successful pairing.

It's important to place the microphone as close to the lips as possible because of the slight latency (an echo, actually) in the wireless path between the headset and the module.

Lightspeed says the communication range between the headset and control module is 20 feet, and we didn't have any issues inside or walking around our aircraft. When using multiple Tango sets (up to six can be used in the same cabin), the channel selector switches in the module and headset will need to be changed so that each pair is set to its own channel. Lightspeed supplies six sets of plastic identification color chips for placing in the headset and on the module so you know which module goes with a given headset.

The Tango offers full stereo sound, but also has a stereo/mono switch for use with mono audio jacks. We found the entertainment input quality to be quite good, but perhaps not quite as good as the company's PFX model, since its fidelity can be fine-tuned through its smartphone app, something not available for the Tango.

The Tango does interface with Lightspeed's FlightLink cockpit recorder app for iOS, for automatically recording (and playing back) intercom and ATC communication.

The ComPriority mode lowers the volume of music and aux audio input during radio communications.

eventually break. One problem is the boom microphone gets in the way of access, so we suggest mounting it to the opposite earcup.

Should the headset battery deplete, it can be powered by piggybacking to the control module via its backup power cable. This is intended as emergency power to restore audio and won't power the noise cancelling circuitry. With tighter clamping and thick ear pads, the Tango does pretty well when passive.

The small main power button

# LIGHTSPEED TANGO CONTROL SET



The mode is commanded by a small button next to the volume control on the right earcup.

The onboard Bluetooth performed well, offering easy pairing by pressing and holding the Bluetooth button on the control module for 10 seconds. After the initial pairing with an Apple smartphone, the set connected easily with a single press of the Bluetooth button, confirmed with three pulses of the blue LED indicator and an audible tone.

We used the Tango with a variety of audio systems—from a flagship PS Engineering audio panel in a Cirrus—to a vintage standalone intercom in a two-seat trainer. We think the Bose A20 edges the Tango in audio quality and perhaps some of that has to do with the wireless circuitry. We seldom heard any interference from other onboard systems, but if you're thinking of making the

jump to a totally wireless headset cabin, we think shielded wiring is essential to flawless performance.

## NARROW TARGET MARKET

According to Teresa De Mers at Lightspeed, the new Tango was developed in response to buyer demand for a wireless model. That isn't surprising. In a world of wireless gadgets, we agree that tethered aviation headsets are becoming antiquated.

On the other hand, once the things are plugged into the audio jacks, most pilots and passengers forget the wires are even there. That's until they attempt to roam around the cabin—an obvious problem a wireless headset certainly solves, particularly for larger, stand-up cabins.

Then there are aerobatic operations. A wireless model can still fall off the head, but you might worry less about

dangling cords getting snagged in the controls while maneuvering. But as we noted, you'll still need to secure the 9-ounce control module after plugging it into the audio jacks.

One benefit we discovered when evaluating the operating range between the headset and the control module is the ability to wear the set while outside of the aircraft. This can be convenient if you want to listen to a comm radio while preflighting. The \$800 Tango is supplied with a generous molded storage case—perhaps the nicest we've seen supplied with any set. It also comes with two lithium ion batteries, an auxiliary audio patch cord, dual AC USB charger, plus two micro USB cables—as if you didn't already have enough.

And that's the other rub with the Tango—it's yet another gadget you have to charge. Two gadgets, actually, when you consider the headset and the accompanying control module. Consider it the price to pay for progress, we suppose.

Contact [www.Lightspeedaviation.com](http://www.Lightspeedaviation.com), 800-332-2421.

**TV TANGO VIDEO**



**AVweb**  
www.avweb.com

# Maule M-7-235C: Utility STOL

*With an engine that can burn avgas, a decent cruise speed and the ability to get in and out short, the M-7-235C is the utility infielder of piston singles.*

by Rick Durden



## AIRCRAFT FLIGHT TRIAL

**M**aule has been building tailwheel STOL airplanes so long, one can't help wondering if the first ones were open-cockpit. In production since certification of the original M-4 in 1962, it's nearly impossible to find a backcountry airport or airstrip that doesn't have at least one Maule parked on it.

Remaining very much a family business—president Brent Maule is the grandson of founder B.D. Maule—the company gradually expanded its line to include nosewheel models and engines that range from 180 to 260 HP while sticking with a steel-tube and Ceconite fuselage, but going to all-metal wings. There are only two versions of the fuselage, the current four-place-plus-baggage fuselage of the MX-7 and MXT-7 models and the slightly taller and deeper fuselage that has room for a fifth seat in the baggage area of the M-7, MT-7 and M-9 models.

The practice of sticking with what has worked and only making design changes after due deliberation, are two reasons Maule has managed to keep the prices of its new airplanes among the lowest on the market—as Brent Maule told us, “On a per-seat basis, our airplanes are the least expensive production STOL planes you can buy.” The company's native

conservatism means competitive pricing, but it also means that those who want a glass panel and the latest gee-whiz gimmicks will have to look elsewhere.

We reviewed the M-7-235C. Equipped with a carbureted, 235-HP Lycoming O-540-B4B5, it is the most popular of the Maule line. It can use auto fuel, which makes it in demand throughout the world because avgas is more and more difficult to find. Brent Maule told us that some 80 percent of its airplanes are now exported.

### STEEL TUBE

The welded 4130 chromoly steel-tube fuselage and tail Maules are built by hand on an assembly line in the company's Moultrie, Georgia, factory. All structural metal receives corrosion proofing and the fuselage members and engine mounts are powder coated. The aluminum spring main gear M-7-235C is designed for backcountry operation; the brake lines are routed through the gear legs—referred to as “gun drilled” by the factory—to protect them from getting ripped off on unimproved strips. The lines are only exposed at the wheels where they tie into the dual-caliper disk brakes.

With a current gross weight of

2500 pounds and an empty weight of about 1700 pounds, depending on equipment, you can plan on an 800-pound useful load for an M-7-235C—for the next few months. If all goes according to plan, Brent Maule told us, Maule will receive a retroactive STC to bump the gross weight to 2800 pounds—the same as the M-7's beefed-up big brother, the M-9.

M-7s coming off the assembly line have been bulked up during production with the same structural enhancements in the M-9, including thicker gear legs, reinforced tail, stronger components in the wing spar and roots and some thicker wing skins. The STC, which should apply to the last several M-7s to come

### CHECKLIST

-  The M-7 offers a good combination of STOL ability and cruise speed.
-  Gross weight is anticipated to increase by 300 pounds soon.
-  On a per-seat basis, the Maule series are the least expensive STOL planes.

*The Observer option replaces much of the fuselage with Plexiglas, right. Brake lines are routed inside the main gear, giving minimal exposure to obstructions, lower right.*

off the line, will increase the useful load to 1100 pounds. With a full load of usable fuel—85 gallons in four wing tanks—that means 590 pounds can be carried in the cabin. Currently, a full load of fuel—a little over seven hours to dry tanks, burning 12 GPH—limits the cabin load to 290 pounds.

The M-7-235C is designed to allow a fifth seat in the baggage compartment, although we found that a pilot must be careful when using it to keep the center of gravity forward of the aft limit. We like the flexibility inherent in being able to carry a lot of fuel when needed for trips into the backcountry or to fill up the cabin for trips of one or two hours.

The cabin size is adequate rather than commodious, so when it's full of people, we doubt they are going to want to sit for more than a couple of hours.

## CABIN

We like the improvements Maule has made to the cabin itself, including optional leather upholstery. The airplane we flew had the Observer package, which seemed to put windows everywhere we looked—a major benefit for an airplane that otherwise has poor visibility, as the pilot's head is right in the wing root. We were impressed with the fit and finish of the entire airplane.

There are four cabin doors. One is on the left for the pilot, with three on the right, at the copilot seat, rear seat and aft baggage/fifth seat area—the entire right side of the cabin opens up.

The backseat is adjustable through two positions—and can be removed in under a minute. The copilot's seat comes out as well, creating a freighter that can carry long items.

We noted that one long-time complaint about Maules—the cabin door latches—has been fixed. The new latches are easy to operate and provide a definitive lock. Gas cylin-

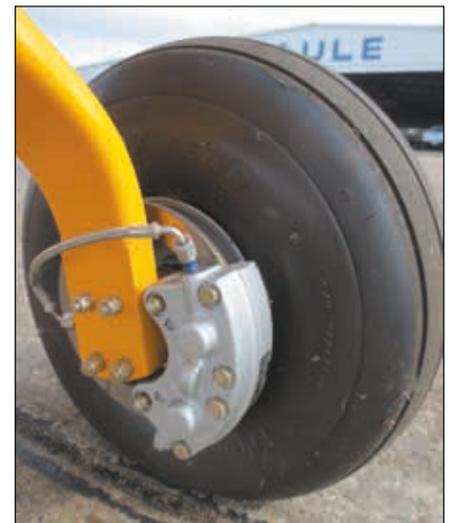


ders ease the process of opening and closing the front door windows—they can be opened in flight up to 109 knots. We like that the airplane can be flown with either or both of the front doors off.

The panel is metal with sharp angles, so a good restraint system is important. The standard system is three-point. That meets certification requirements, but with the relatively high landing accident rate of tail-wheel airplanes, especially those in regular use in the backcountry, we recommend buyers opt for the better, four-point system that is an option. We'd like to see Maule make it standard.

The 85-gallon fuel system uses four tanks. The engine can draw from either or both of the inboard tanks. Electric transfer pumps are used to move fuel from the outboard to inboard tanks. Transferring fuel too soon can result in overfilling the inboard tanks and venting fuel overboard. Transferring a full tank takes about 45 minutes. While the fuel system has some complexity, our last review of Maule accidents in our *Used Aircraft Guide* did not indicate that the series had an unusually high percentage of fuel-related accidents.

The Approved Flight Manual for the M-7-235C contains only the basics required by the FAA. There is no performance data. The pilot has to reference the Lycoming engine manual to get power settings and fuel consumption and then go fly



the airplane and see what it does. It also means the pilot has to do some homework to determine takeoff and landing performance. We're not crazy about the lack of takeoff and landing performance data.

The airplane we flew was equipped with VGs. Brent Maule and his father Ray told us that VGs reduce stall speeds on the various Maule aircraft an average of seven knots with the flaps up and three with the flaps down. Consequently, VGs have been long been offered as an option.

## FLYING IT

Preflight is conventional. There are two fuel quick drains just aft of the step on the left side of the fuselage and one at the low point of each of the four fuel tanks. The only rapid access to the cowling is the oil filler/

## SO, WHAT'S THIS STOL STUFF?

Not long after Maule founder B.D. Maule moved the company to Moultrie, Georgia, he made a number of takeoffs from inside two of the company's hangars. He was able to break ground inside and had to stay low until flying through the door. While the hangars are more than 200 feet long, it was impressive advertising.

We've seen a lot of claims by manufacturers that their airplanes were super-duper STOL machines—and we have long wondered what it all means. When we looked for an official definition of Short Takeoff and Landing (STOL), the best we could find was an old Department of Defense and NATO guideline that called for such airplanes to be able to takeoff and land over a 50-foot obstacle within a total distance of 1500 feet. Although it's not stated, we assume that's at sea level. In reality, 1500 feet over obstructions is pretty darn short.

If the pilot involved has the requisite skill level, the Maule M-7-235C meets the 1500-feet-with-obstructions at sea level performance definition easily, as does its current production competitors, the American Champion Scout and Aviat Husky. We'll include a popular mod—the four-place Peterson 260/King Katmai canard conversion of the Cessna 182 in the lineup. There are also a number of LSAs that meet the test without breaking a sweat, as well as several out-of-production machines such as many of the higher-powered, high-wing Piper line.

Of course, the follow-up question is the one that has been argued by pilots for decades—which of the available STOL airplanes can take off and land in the shortest distance? The answer is—drum roll—it depends.

The Maule, Katmai, Husky and Scout are in the same ballpark based on published data (there is none for the Maule) and experience. Ground roll distance at gross weight, on a hard surface, at sea level, on a standard

day—per the Approved Flight Manuals from the manufacturers—for the Scout is 417 feet and for the Husky 580 feet (for reasons we can't fathom, Aviat has put out advertising that claims a 200-foot takeoff ground roll—a third of its own test data distance). For the King Katmai mod, it's published at 290 feet. We've flown all of them and think their numbers are accurate. Our experience with the M-7-235C is that a realistic distance for its gross weight takeoff roll is on the order of that of the Scout or Husky.

With that as background, we have participated in, observed and watched videos of short takeoff and landing competitions. With the airplanes involved operated at the absolute minimum weight possible, including a skinny pilot, we have seen takeoff and landing rolls (with a little wind) of Scouts, Huskies and Maules of only a few airplane lengths. Which production airplane will takeoff and land in the shortest distance on a given day is, in our opinion, a matter of weight, pilot ability and wind conditions at the moment the effort is made. All that being said, we think the Maule M-7-235C can hold its own with the best of the competition.

For operation in the real world, with passengers and baggage, we think the Maule series, Katmai series, Husky and Scout clearly qualify as STOL airplanes. In our opinion, the most important variables are pilot skill and self-discipline in operating the airplane within the design parameters set by the manufacturer (for example, Aviat calls for all crosswind takeoffs in Huskies to be made with the flaps up). We have reviewed scores of accident reports for STOL airplanes in the backcountry and note that a significant proportion of the crashes involved hitting obstructions after liftoff or on short final, or being unable to stop on the available runway. Those are pilot issues.



dipstick door on top, so it's not possible to get a good look at the engine room.

Ground handling of the M-7-235C is about as good as it gets for tailwheel airplanes, so long as there is not a strong wind. The airplane tracks well and most turns can be initiated and stopped with rudder alone. With standard tires—larger bushwheels are an option—visibility over the nose, other than the 1:00 to 2:00 position, is good.

The maximum demonstrated crosswind is 12 knots. In our *Used*

*Aircraft Guide* on tailwheel Maules in the June 2013 issue, owners told us that the number is to be respected.

The M-7-235C has five flap positions. The completely retracted position is a negative seven degrees, which Maule calls the reflex position. It is used to get extra speed in cruise. The first detent is zero degrees, the second is 24 degrees—used for takeoff—and the last two are at 40 and 48 degrees. Takeoffs are normally made with 24 degrees.

Rather than taxi nearly a mile from the factory to the paved

runway, we took off from the ramp in front of the factory—a regular procedure, we learned. Loaded to 2300 pounds, takeoff roll on a calm, 80-degree day, was on the order of 600 feet. No effort was made to make a short takeoff, the airplane flew itself off the ground from a tail-low attitude at 45 knots. Once the flaps were up, the rate of climb stabilized at 1200 FPM.

The elevator trim rate and effectiveness is such that it is easy to trim the airplane for a given airspeed but not so powerful that an out-of-trim

*The panel has space for VFR and IFR avionics options; round gauges are a feature, right. Flaps reflex up seven degrees for more speed in cruise, lower right.*

situation can challenge the pilot to keep things collected. For STOL operations and go-around from low speeds with full flaps, we think this can be a safety-of-flight issue and we like the trim on the Maule. There is little trim change with flap deflection, other than when going from zero degrees to the negative seven-degree reflex position.

Steep turns, with rapid roll rates into and out of the turns were without drama. Dropping some flap allowed the airplane to nearly pivot. The power-off stall, with full flaps, broke with a slight roll to the left at 43 knots. At full power, flaps up, we saw 34 knots indicated without getting a break or mush.

For STOL airplanes, aileron control and the skill level necessary to coordinate turns at very slow speed are safety-of-flight items, in our opinion. We flew the M-7 at 40-45 knots indicated with full flaps and rolled rapidly in and out of steep banks. The ailerons remained very effective, with little slop or delay. Maules have a rudder trim tab that is actuated by movement of the ailerons to assist in coordinating turns at low speeds.

We found the work load involved with keeping the ball in the center of the race to be noticeably lower than STOL airplanes with high levels of adverse aileron yaw such as the Super Cub or Husky. We consider ease of coordination a safety factor when maneuvering at low speed as an inadvertent stall is bad enough—a cross-control stall almost guarantees a significant wing drop and incipient spin, dramatically increasing the altitude required for a recovery.

Even though there is no cruise performance material for the M-7, we were curious. The airplane was new enough that the engine had not been broken in, so we kept it at 25 inches and 2500 RPM, for much of



our flight—a setting over 75 percent power. At 4000 feet, that generated a true airspeed of 138 knots with the flaps at zero and 143 knots with the flaps reflexed. Operating the engine at a more realistic 65 percent power should generate cruise speeds more in the 125-knot range, consistent with what we've been told by users.

## LANDING

With full flaps, the airplane is rock solid on the approach, so precise speed control is not difficult, especially if trim is used liberally. The Vernier throttle takes some getting used to—normal operation involves turning it in or out; making a large power change quickly requires pushing a button before sliding the throttle. Watching videos of experienced Maule pilots touch down, snap the flaps up and stop in a few airplane lengths indicate to us that they have no problem with a Vernier throttle.

One of the problems faced by STOL-capable aircraft pilots on approach is a nose-high attitude that blocks the view of the touchdown area—which can be a serious problem in the backcountry.

One of the best airplanes for over-the-nose visibility on a STOL approach and landing is the Peterson 260/King Katmai mod of the Cessna 182. While not as good as the Peterson 260 series, we found the Maule M-7 to have better-than-average over-the-nose visibility on a short field approach.

A three-point touch-



down requires full aft yoke—as is the case with most tailwheel airplanes. However, it seems to be accomplished slightly more easily than in other tailwheel machine. Rollout requires what we considered to be the normal amount of attention for a tailwheel airplane.

The base price for the M-7-235C is \$250,000 and includes a full-gyro panel and VFR radio package—it's not a stripped airplane. The airplane we flew had a slightly more advanced VFR radio package, VGs, the Observer package and other options that brought the price up to \$320,000, an amount we consider low for a highly capable, four-place airplane.

## CONCLUSION

We think the M-7-235C is an airplane that does many things well, including cruise at a reasonable speed. Tailwheel handling is, in our opinion, better than average, but still requires pilot proficiency. We like that for about the price of the two-place backcountry airplanes, a buyer can take more people or stuff and go into the same strips. We think the anticipated 300-pound gross weight increase will add substantial value to an already good machine.

TV MAULE VIDEO

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# Your Flight Review: Maximizing Value

*Keeping the cost down and getting the most out of your flight review means good communication with your CFI and doing your homework ahead of time.*

by Rick Durden

The Flight Review (FR, it hasn't been BFR for decades) is a fact of every pilot's aeronautical life. FAR Part 61.56 mandates a flight review or one of a specified list of alternatives every 24 calendar months for every person who desires to fly as pilot in command. Most pilots chose to take the flight review route to compliance—rather than one of the alternatives (see sidebar below). As with anything we do around aircraft, how can we maximize the value of our flight reviews while minimizing cost and inconvenience, especially if we haven't been flying much and are a little concerned about maybe being rusty in some areas?

The good news is that there are a number of resources available to pilots to help them through their flight review, and that the best of those

are free. We'll give you a rundown of what's available as well as how to work with an instructor to make the review as efficient as possible and look at the alternative methods of complying with the recurrent training requirement.

## WHAT IT IS

Stripped to the essentials, to successfully complete a FR, the FAA requires that you spend a minimum of an hour of ground and flight training and receive an endorsement from an authorized flight instructor that you have demonstrated the safe exercise of the privileges of your pilot certificate. The subjects to be covered on the ground are operating and flight rules of FAR Part 91; in the air, the maneuvers and procedures required are at the discretion of the instructor.

Because of the discretion allowed on the part of the instructor, our recommended approach to flight reviews is to communicate with the instructor ahead of time to tailor it to your particular needs.

## FREQUENCY

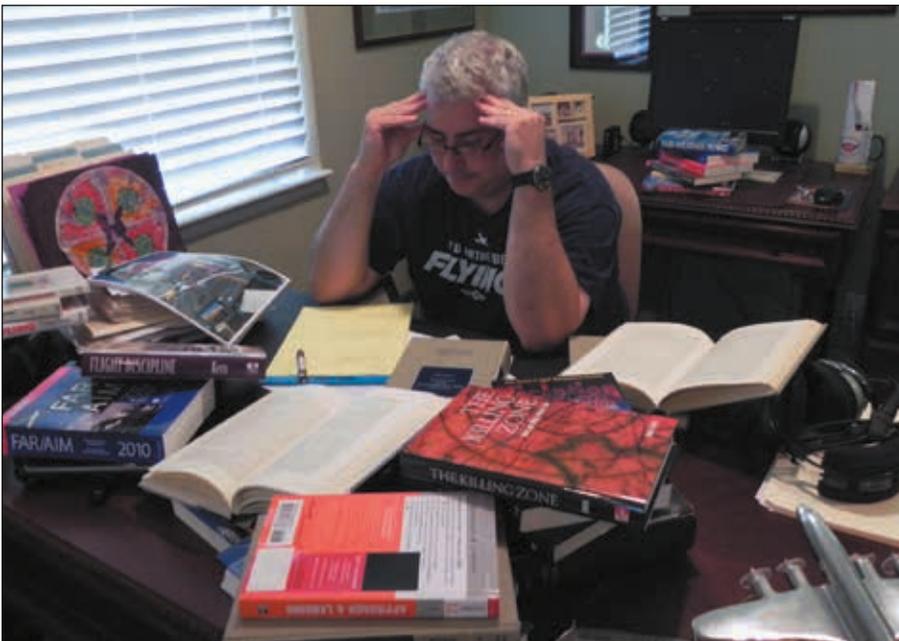
A flight review is only required biennially (once every two years—not biannually, twice a year). Nevertheless, our research into accident data indicates that a major variable in the risk faced by a pilot on any given flight is the period of time since her or his last flight review—the longer, the higher the risk. Frequent recurrent training is a magic bullet for flight safety—it's a major reason that pilots who are required to take recurrent training every six months have an accident rate that is only a fraction of that of all of general aviation. So we'll say it up front, we recommend taking a flight review every six months—there's no downside and the data says there is a big upside.

## TAILOR IT

In researching this article, we spoke with instructors at a number of flight schools. Most told us that they wanted to communicate talk/email/text with the pilot well in advance of the scheduled session. They wanted to know the type of flying the pilot was doing, how often she flew and what the pilot felt were her strengths as well as areas that needed work.

The instructors also said that the geographic area where the pilots regularly flew mattered. Amelia Jayne, who has been instructing for over 30 years at Michigan Flyers in Ann Arbor, Michigan, told us that such things as the proximity of an international border, Class B airspace, Saturday TFRs over the nation's largest football stadium (within two miles of the airport) and Great Lakes weather all were items to fold into a FR a pilot takes in southeastern Michigan.

*Relax, getting ready for your flight review isn't this bad. Some conversations with your instructor in advance and a reasonable amount of directed study should make the flight review a low-stress event.*



# FLIGHT REVIEW PREP RESOURCES

With flight reviews being the overwhelming method used by pilots to comply with the Part 61.56 recurrent training mandate, it's no surprise that there are preparation materials available from a number of sources. Our survey of what's out there uncovered a half-dozen good ones.

AOPA and the Air Safety Institute (<http://tinyurl.com/zl3maah>), have a number of videos, online courses and web pages that provide material of benefit to pilots preparing for their FR. Specifically, other than the acting, we like the 34-minute video specifically on the FR as well as the *Pilot's Guide to the Flight Review* put together by the Institute. Both provide solid information and are free.

Better still, and also free, is the FAA's Flight Review Preparation Course (<http://tinyurl.com/gnk2a4q>). We were pointed at it by the Michigan Flyers' Amelia Jayne. It's a structured, online guide to the relevant regs and advisory materials needed for the ground portion of a flight review. It's broken into four segments, Pilot, Aircraft, enVironment and External pressures and includes a review and exam. The exam questions are what the FAA calls "mini-scenarios" designed to test a pilot's understanding of how the regs apply to real-world flying.

Sporty's ([www.sportys.com](http://www.sportys.com)) offers what we consider to be an in-depth online flight review course for \$34.95. It goes into aeromedical factors, airspace, publications, regulations, airport signage and markings and weather. It's compatible with Windows, Mac and iPad. It has been accepted for FAA WINGS credit and includes a quiz. If you score at least 80 percent on the quiz, you receive an endorsement from Sporty's Academy stating that you have completed the one hour of ground training required for

the flight review—although accepting it is at the discretion of your instructor.

For your iPad or iPhone, there's Sporty's Flight Review Aviation App. It includes interactive questions to help you prep for your FR as well over an hour and a half of videos and animation. At \$24.99, it appeared to us to contain the materials in the more expensive interactive course and the FAA's FR publication as well as a quiz, but not the completion endorse-

ment. Sporty's also offers a 55-page, spiral-bound guide and reference entitled *Bienial Flight Review* for \$7.95. As the title implies, it's a bit dated. It also has no index, which we would like to see.

At \$12.95 and 160 pages, the *ASA Guide to the Flight Review for Pilots and Instructors* (<http://tinyurl.com/otfdvvn>) is advertised as a one-stop guide for pilots preparing for their FR. We

like that it has an index, making it a handy reference guide. It may be more than is needed for the FR, but at the price, we think it's an excellent and handy reference.

King Schools (<http://tinyurl.com/ncttk7d>) has produced what it refers to as a Flight Review Bundle that is available online or as a DVD for \$119. It consists of three of the King courses, Pilot Communications, VFR Regulations Refresher and The Complete Airspace Review. We like the depth and breadth of King courses, but the price, in our opinion, is not competitive.

We think that a pilot who wants a solid preparation for the flight review can get all that she or he needs with the free material from the FAA and Air Safety Institute. Hey, free is not only good, but here it's good quality. For a handy reference guide at a reasonable price, we recommend the *ASA Guide to the Flight Review for Pilots and Instructors*.



Michael Shannon, until recently the chief flight instructor at the Aspen Flying Club on Denver's Centennial Airport, pointed out there were specialized issues to discuss with regarding to flying where the Great Plains met the Rockies, but emphasized that one of the significant risk factors faced by even pilots who flew regularly was the things that they didn't do practice—usually emergency procedures and maneuvering. We especially liked one of the areas he included during the pre-FR conversa-

tions he had with his clients: asking their flying goals for the next year, so he could incorporate them into the FR and get the pilot started toward those goals.

Shannon also told us that many of the pilots who went through tailwheel checkouts at Aspen also completed a flight review. As there is little extra to do to comply with the FR requirements on top of a tailwheel endorsement, it made sense to us.

Based on our conversations with instructors who regularly give flight

reviews, pilots who have had good and bad experiences with flight reviews and giving FRs, we cannot recommend strongly enough good pre-FR communication between you and your CFI in which you discuss the flying you're doing, the flying you want to do and the things that make you uncomfortable.

In those conversations, we also recommend discussing the specific risks you face in the type of flying you do—such as runway loss of control on landing, night instrument



*Instructors told us that it's common for pilots getting a tailwheel checkout to also turn it into a FR, top left. Tailoring your flight review can allow you to add upset recovery, middle right, and time on the gauges, bottom left.*



approaches, low altitude maneuvering—and how you want to factor training to reduce those risks into the FR. A little time spent with the Nall Report (<http://tinyurl.com/pvet9eb>) with its general aviation

accident data can help you identify risk factors for the type of flying you do.

If you regularly fly one or a few types of airplanes, log into *Aviation Consumer's* website ([www.aviationconsumer.com/](http://www.aviationconsumer.com/)) and look up the *Used Aircraft Guides* for those airplanes. You'll find a breakdown of the types of accidents for each. If, for example, you fly an

airplane that has a high proportion of fuel-related accidents, a review of the fuel system is probably a good idea during the ground portion of your FR.

Your instructor should tell you

the areas of Part 91 operations that he will ask you about and can point you at reference material to help you brush up.

In terms of the risks you face of violating a reg, the hot items are TFR and airspace busts as well as runway incursions. Airport surface markings and signage continue to evolve and ATC terminology for surface ops have changed, so those are always areas to plan on covering during your FR.

The pre-FR conversation with your CFI is also the time to ask the questions that you want answered. As you are preparing, make a list of your questions and get them to your CFI. We think a good FR is a two-way street.

By the time you have completed your pre-FR communication with your instructor, you should have an agenda outlined. The idea is for there to be no surprises for you during the FR. You cannot fail a flight review—it's not a checkride. Nevertheless, in our opinion, the purposes of a FR are for you to brush off the rust, assure you know the regs that affect the flying you do, know the systems of your airplane and can demonstrate that you can fly the airplane in a safe manner, exercise good judgment and handle emergencies. It is not a stump the chump exercise—the entire environment should be supportive and open so that you can meet your goals and get the endorsement you need.

### **KEEPING IT AFFORDABLE**

By and large, the more you put into preparation before your FR, the more likely it is that you'll finish up without breaking a sweat or the bank.

That means doing your homework so that you are ready to demonstrate that you know Part 91 and your airplane so that you don't drag out the ground session. Going into your FR as an empty vessel to be filled up by

your instructor is a sure way to make it expensive.

Recognize that if you haven't been flying much, you may not finish up your FR in one session. That's okay. The idea is to demonstrate proficiency—getting there may take some practice with your CFI. It may turn out that all the hundred-dollar-hamburger flights you've been making mean that you can hold altitude in cruise within 50 feet and make great landings, but that it's been so long since you did any maneuvers or tried a forced landing that your first attempts are embarrassing. Again, that's okay. You're in the perfect situation to get those rusty areas fixed without putting yourself or passengers at risk—with an instructor in the other seat ready to catch you if you slip off the tightrope.

The FR is also an ideal time to push the limits of your comfort zone. Why not spend a few minutes assuring yourself that the airplane can be flown safely within a few knots of the stall or practice landing in a strong crosswind?

## THE CFI'S OBLIGATION

As a client, your CFI has obligations to you. Above all, he should be professional at all times. In preparation for your FR, your CFI should be willing to spend time setting up a syllabus or agenda for what you will cover and objective standards you will have to meet to receive an endorsement of satisfactory completion. You should know in advance how much your CFI charges for instruction—usually an hourly rate that includes time on the ground and in the air. If you don't get all the above, go elsewhere.

Professionalism on the part of your CFI also includes being on time for your FR and fully prepared, not allowing interruptions during your session, providing a frank evaluation at the end and an endorsement of satisfactory completion if you met the performance demands.

In our opinion, an ethical instructor will challenge a pilot to perform at the top of his or her skill during a FR and, recognizing the safety value of recurrent training, will never provide an endorsement for inadequate performance—or not even flying—in return for a fee or favor.

While most FRs are completed in

## FLIGHT REVIEW ALTERNATIVES

While most pilots comply with the Part 61.56 recurrent training requirement by taking a flight review, there are attractive alternative methods of meeting the mandate.

Paragraph (d) of the reg states that if you take and pass a pilot proficiency check conducted by an examiner, an approved check airman, or a U.S.

Armed Force, for a pilot certificate, rating or operating privilege you don't have to take a flight review. So, if you fly under Part 121 or 135 or are a

military pilot, the checkrides you take meet the flight review requirement. In addition, one of the benefits of pilot self-betterment is that when you add a rating, the fact that you passed a checkride meets the requirements of 61.56 and starts the



flight review clock ticking anew.

We know a number of people who made the decision to get a seaplane rating because they were going to spend a proportion of the cost of the cost of the rating for a FR, so they might as well as have the fun of learning to fly floats while also getting credit for a FR.

We like the FAA's WINGS Pilot Proficiency Program for a number of reasons, not the least of which is that the accident rate for pilots who are

current in it is astonishingly low, as noted by our sister publication, *IFR Refresher*. Another reason is that if you complete what is referred to as a phase of the program, you've just met the requirement of a flight review.

one session (weather permitting), if you are rusty it's reasonable for it to take multiple sessions. That should be understood going in. A CFI should never refuse an endorsement by calling for an additional session because of a desire to make more money off of the client. The objectives and completion standards should be such that if the client doesn't meet them, the client will know it.

One of the toughest times an instructor has is with a client who does a poor job during a FR session and also is so poor at evaluating himself that he thinks he did great. It's rare, but it happens, and a good CFI will deal with it by using objective standards to show failure to comply such as inability to hold altitude, heading or airspeed within agreed parameters.

On the other hand, there are some instructors who do prolong FRs unreasonably. If you feel that is happening or has happened, we recommend stopping the session,

stating that you feel you had met the parameters and the reasons why. If the instructor does not agree, escalate it to the chief instructor. You may or may not get some portion of a refund. Nevertheless, if you do not receive an endorsement that you believe, as objectively as possible, you deserved, go to another instructor and finish up. Note, however, that if your FR has elapsed, you cannot fly as PIC—and that means solo—until you get another endorsement.

## CONCLUSION

We think that flight reviews, especially conducted at least once a year, increase flight safety. We recommend that for the most effective and efficient flight review, a pilot should be willing to communicate with his CFI ahead of time to set up an agenda and completion standards and then do his homework into the easily available review materials. That should help a pilot to get the greatest benefit from the flight review session while keeping the cost reasonable.

# LSA Audio Shootout: PDA360EX Tops

*PS Engineering's PDA360EX non-certified Bluetooth audio panel is plug-and-play with Garmin and engineered specifically for LSA and kit applications.*

by Larry Anglisano

Whether you're building a new kit or expanding the panel of a legacy or newer LSA, the current audio panel market is confusing. For VFR missions in a two-seat LSA, you don't need some of the advanced features that tag along with TSO'd systems, including marker beacon receiver, six-seat intercom, cabin PA and even speaker operation. But you probably want Bluetooth music capability and a wireless telephone interface, plus the ability to pipe in traffic and other warning systems.

PS Engineering and Garmin have versions of their flagship and certified (read higher cost) audio prod-

ucts, but are trimmed and enhanced for LSA and kit applications. To see how they compare, we put them on our test bench for a critical evaluation of audio quality and feature set. Herewith are the results.

## PS ENGINEERING

The two non-certified audio panels in PS Engineering's lineup—PDA360EX and PMA5000EX—trickle down from the company's certified systems, notably the PMA450 and PM8000-series. Without the high cost of FAA certification (which of course is passed along in certified products), the EX-series have many of same features of PS Engineering's

flagship panels, but with additional capabilities that cater to the LSA applications.

First, the \$1995 PDA360EX, a descendent of the company's flagship PMA450, which is equipped with PS Engineering's IntelliAudio technology. Measuring 1.30 by 6.25 by 7.15 inches and weighing 1.5 pounds, the PDA360EX is plug-and-play with Garmin's GMA240 LSA/experimental audio panel. Other than price, it's worth noting that the PDA360EX differs slightly from the PMA450 in that it has a four-seat intercom (instead of six in the PMA450), it doesn't have marker beacon functions, it can't support a cabin speaker and it has no public addressing capability. But it does have advanced audio processing through IntelliAudio.

Licensed from the U.S. Air Force, IntelliAudio helps present the audio sources in a way that's more intuitive to process, or at least in a way that mimics how the human ear hears and registers sound (similar to what Garmin does with its 3D Audio function). Air Force pilots know this technology as Multi-talker.

IntelliAudio places Comm 1 and Comm 2 audio in various positions within the stereo headset, making simultaneous incoming radio signals sound as if they are coming from different locations.

For example, the user can place the signal sources in nine unique positions. The intent is to make it easier for the pilot to concentrate on the radio of choice while ignoring the radio of lesser importance at the time.

For example, the pilot can choose to pay attention to ATC while ignoring an ATIS broadcast, depending upon what is pertinent at the moment.

PS Engineering attempts to



*Our bench mockup, bottom photo, included a critical evaluation of music quality originating from an Apple iPad, played through a variety of noise-cancelling headsets. Garmin's GMA240, top, is wired the same as the PS Engineering models.*

simplify the user interface with an LCD bezel display, while retaining traditional push buttons and a rotary volume knob for radio switching and basic intercom settings. The display is especially useful for configuring the IntelliAudio dimensional sound (HRT) function. This is essentially a graphic showing where the sound is positioned relative to your head. You can turn the IntelliAudio off and listen to the audio in a traditional manner through the IntelliAudio soft key on the display. The setup is refreshingly intuitive, in our opinion.

Once in the IntelliAudio mode, repeated pressing of the Comm 1 or Comm 2 line select keys moves a corresponding half-circle cursor to the locations relative to the listener graphic that's on the display. Press Done to exit and save the configuration, where it's recalled at every system power up.

A comm radio monitoring mode takes the interface one step further by allowing the secondary radio audio to be muted by the primary radio (or the one being used for transmissions) when there's activity. This essentially automates my cat-and-mouse process of cranking the volume down when listening to ATIS on the second radio whenever a call comes in on the primary.

PS Engineering has always taken entertainment and telephone input to a higher level and the PDA360EX is no exception with its integrated Bluetooth transceiver. The feature set includes an onscreen Bluetooth telephone control, plus a bezel-mounted USB port, which can be used for charging. It provides 5 VDC and 1.5



amps of current, which can effectively charge most smartphones and tablets. When the phone rings, an incoming call menu opens, showing caller ID. Simply answer the call by pressing the top line select soft key on the display.

As we expected, the entertainment input music quality is flawless, especially when listening through the new Bose A20 and AKG AV100 ANR headsets, but what's missing is a music volume control on the bezel. To adjust entertainment volume, you need to access the command from the onscreen menu. Not a huge deal, but dedicated hard keys sure would be more convenient, just as it is on the PMA5000EX—a panel not equipped with Bluetooth. More on that system in a minute.

The music input function has three modes. In the All mode, music will mute with either intercom or when there is radio activity. In Karaoke mode, the music only mutes during outgoing radio transmissions and in Radio mode it will mute whenever the comm radio breaks squelch. A dedicated bezel-mounted music On/Off button is handy for quickly stifling the music.

The PDA360EX is equipped with an internal readback recorder, which captures up to 45 seconds of audio. Recording is automatic and both the pilot and copilot can hear the playback.

The PMA5000EX is much like the company's certified PMA8000B audio panel. It's a direct slide-in replacement for Garmin's GMA240 and GMA340 audio panels and has

*Our hands-down favorite feature in PS Engineering's PMA5000EX, top, is the dedicated music volume keys at the far right of the bezel. The company's PDA360EX, bottom photo, has an LCD display for shallow menus and easier configuration.*

a four-seat intercom, unlike the six-place capability in the PMA8000B. Also unlike the 8000B, the 5000EX doesn't have marker beacons, cabin speaker output and it doesn't have a digital readback recorder.

What we really like about the PMA5000EX is the ability to adjust music input volume from the front panel. Simple Up and Down volume keys serve as a master gain control, while the entertainment volume can be tweaked on the music device. The 5000EX incorporates the SoftMute function described above and can accommodate two music inputs, including the 2.5 mm bezel-mounted input jack. It can accommodate cell phone input, music input and an advisory audio input. You'll need to purchase PS Engineering's 2.55 mm adapter patch cable to connect these devices. There are a variety to choose from, based on the model of your phone.

While the 5000EX has four unswitched inputs, it also has two auxiliary switched inputs (these are controlled with dedicated bezel

## CHECKLIST



All the non-TSO'd audio panels offer exceptionally good audio quality.



But, that also depends on the quality of the wiring—which can be a chore for amateurs to get right.



These panels are for LSA and experimental applications, which reduces cost and enhances features.

## NON-CERTIFIED AUDIO PANELS COMPARED

MODEL	PRICE	BLUE-TOOTH?	INTERCOM STATIONS	COMMENTS
GARMIN GMA240	\$850	NO	Two, dual music input	We wish it had Bluetooth, but like its no-frills price point and simple control set.
PS ENGINEERING PMA5000EX	\$1095	NO	Four, dual music input	Every audio panel should have music volume controls on the bezel. This one does.
PS ENGINEERING PDA360EX	\$1995	YES	Four, dual music input	Easy plug-and-play with Garmin GMA340/240, advanced feature set.

keys), which have a convenient muting function. Simply press and hold the key of the input source you want to mute for two seconds and it stifles the warning audio for 60 seconds and then returns to normal alerting mode. This might be useful for muting traffic alerts in high-density traffic areas and terrain warnings when flying low, for example.

At \$1095, the PMA5000EX is \$800 less than the certified PMA8000B, while the PDA360EX is \$400 less than the certified PMA450. The EX-series comes with a one-year warranty, which is two years less than the warranty on certified panels. Additionally—and this is important—PS Engineering doesn't offer a warranty on these products unless they are wired by an authorized PS Engineering dealer.

### GARMIN GMA240

Garmin's non-certified stereo audio panel is the \$850 GMA240, which borrows some function and ergonomics from the early-gen GMA340 and current GMA350-series.

If you're looking for Bluetooth functionality you won't find it on the GMA240. You'll need to buy Garmin's \$2300 flagship and FAA-certified GMA350c. We reviewed it in the September 2015 issue of *Aviation Consumer*. It has Garmin's Telligence voice recognition system for commanding the panel with voice commands, but the function is missing in the GM240.

Measuring 1.30 by 6.29 by 7.12 inches and weighing 24 ounces including the mounting rack and connectors, the GMA240 sports a simple control set. The GMA240 accommodates two comm radios (and two nav receivers) and has a four-position intercom, which can also be wired for two seats in two-place cabins.

LED-illuminated push buttons (which have a positive, high-quality feel) control the main functions,

while rotary knobs on the left and right side of the bezel control pilot, copilot and passenger volume and squelch threshold. The pilot's rotary knob serves double duty as a power control, or the unit can be switched on and off with an avionics master switch. In the event of an electrical system failure, a fail-safe circuit connects the pilot's headset and microphone directly to the primary comm radio, while an audio warning advises that power is interrupted or that the unit was powered off.

Garmin has a function called Master Avionics Squelch, or MASQ, which is internal processing circuitry, helping to reduce ambient noise inherent with the VHF radio inputs. MASQ isn't a substitute for the panels' adjustable squelch control, but instead is always working in the background to reduce noise. As expected, each microphone on the intercom has a dedicated VOX (voice activation) circuit to ensure only the active microphone is heard with an open squelch. Also as you would expect from a modern panel, the intercom provides two modes of isolation, Pilot (for privacy) and All (where everyone is on the intercom), controlled by pressing the Pilot ISO Key.

But there isn't a standard crew isolation mode to separate the back seats from the front (an issue which doesn't apply to two-seat LSAs, of course) unless it's configured with additional wiring. But in doing that, crew isolation also eliminates the pilot isolation function. Some other features, including gain levels are enabled with internal jumpers and potentiometers.

The GMA240 accommodates three unswitched audio inputs, which have configurable volume level. These can be used for traffic and terrain system, engine monitor, and landing gear advisory and other attention-getting audio alerts.

One feature we're fond of is Monitor Mute. Controlled with a dedicated

bezel key, it mutes the audio from a secondary receiver when the primary radio receives incoming audio. You might be listening to an ATIS broadcast on the secondary comm radio, but receive a radio call on the primary. Monitor Mute can work as a backstop for not missing calls.

The GMA240 provides for two wired stereo entertainment inputs—controlled with the Music1 and Music2 push-button switch. A music input jack is also located on the GMA240 front bezel. This jack can accept a music player input or compatible telephone sources, allowing you to have a phone conversation in full duplex. The system has a Master Music bezel key for selecting and deselecting music input, the ICS bezel key enables automatic music muting during intercom activity and a Radio bezel key, which mutes the music during radio reception.

We hope for a replacement panel with more of the features that are built into Garmin's flagship GMA350c, including Bluetooth.

### TOP PICK

For us, the easy top pick in this roundup is PS Engineering's PDA360EX. We like that the company included cutting edge features (including Dimensional Sound) found in its flagship certified product, while tailoring the feature set around the typical LSA mission, but you'll pay. At \$1995, it's the most expensive. Garmin's \$850 GMA240 is a good value, but missing are some modern features we think buyers will want, including Bluetooth.

Last, if you plan to install these yourself, consider that PS Engineering will not validate the warranty unless the wiring harness was built by a PS Engineering dealer. It can also provide a custom harness, based on your specifications.

## CONTACTS

Garmin  
800-800-1020  
[www.garmin.com](http://www.garmin.com)

PS Engineering, Inc.  
865-988-9800  
[www.ps-engineering.com](http://www.ps-engineering.com)

# Nitrogen for Tires? Benefits are Elusive

*Michelin recommends nitrogen for all aircraft tires while Goodyear is agnostic. The argument for the expense and bother of N<sup>2</sup> remains unconvincing.*

by Paul Bertorelli

The ultimate dream of the marketing department is to somehow extract profits from thin air and this very thing may have been achieved, literally, with the nitrogen-filled tire. Car dealers now offer this special service as an “upgrade” for prices of up to \$100 or more and we recently heard from an aircraft owner asking about this for his Cessna.

Does it make any sense to bother with finding a shop that can fill your tires with exotic nitrogen or can you muddle along on the rather prosaic compressed air, straight from the shop supply hose? No surprise we’re gonna go with the latter answer, but that’s not to suggest that nitrogen-filled tires are entirely without merit. They just make little or no sense for small aircraft tubed tires.

For large aircraft, it’s another matter. FAR 25.733 requires that all tires on braked wheels on airplanes heavier than 75,000 pounds be filled with dry nitrogen so that the tire contains less than 5 percent oxygen. The reasons for this appear to be several. Nitrogen is inert and is less of a fire hazard than air, albeit it’s difficult to imagine it being much less of risk. Nitrogen is also less susceptible to temperature-induced pressure changes which aircraft operating in the flight levels obviously must contend with.

It’s not clear exactly when the nitrogen fill became fashionable for car tires, but it probably evolved as an economy measure; nitrogen-filled tires hold pressure longer and supposedly run cooler than tires inflated with plain air do. This, theoretically at least, translates to improved fuel economy and less tire wear. But not

so fast, says *Consumer Reports* magazine. It did a year-long test in 2006 comparing pressure loss in tires inflated with air against those inflated with nitrogen.

The N<sup>2</sup> definitely won the shoot-out, but the difference was trivial. Among 31 pairs of tires, the nitrogen-filled buns lost

2.2 PSI against the air-filled tires’ 3.5 PSI loss.

Other claimed benefits of nitrogen include less wheel corrosion on tubeless rims and less degradation of tires on the inside due to decreased oxidation. Not explained is that the outside of the tire, exposed to UV and polluted air, will probably rot faster anyway.

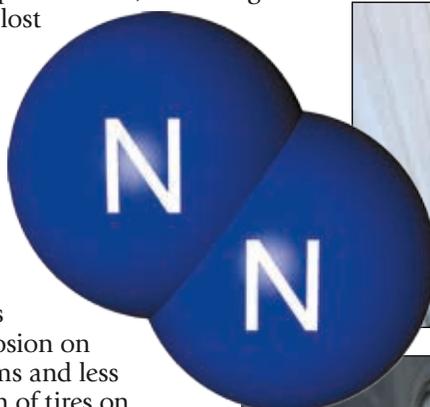
How about little aircraft then? As noted, Michelin’s technical material recommends nitrogen for all aircraft tires, regardless of size. Our queries

*As a diatomic molecule, top, nitrogen is slightly larger than oxygen, thus permeates more slowly through rubber. Most shops have nitrogen for charging struts, but not all will have low-pressure regulators for filling tires.*

to clarify this were not returned. Goodyear, on the other hand, is agnostic on nitrogen fills for aircraft under 75,000 pounds.

“The mounting recommendation calls for dry nitrogen for tubeless tires,” says Goodyear’s Ed Knetig, and while there are a few tubeless wheels for small GA aircraft, the vast majority are tubed. “In the tube type, the air isn’t in contact with the wheel, so corrosion doesn’t matter,” Knetig added. So the official Goodyear recommendation on nitrogen for light aircraft tires? “Don’t have one,” Knetig told us.

Our view is that if you have nitrogen easily (and cheaply) available, it may reduce the frequency of topping off, but perhaps not enough to notice. Fuel mileage isn’t an issue with airplanes and these days, many tires dry rot before they wear out. So our advice is to use cheap old air and save your money.





## Cessna 182 Skylane:

*From early straight-tails to G1000 models, the market is littered with fixed-gear Skylanes at a variety of price points.*

Perhaps one reason for the 182 Skylane's longevity is that it has good hauling capability, good dispatch reliability, a relatively comfortable cabin and maintenance shops know how to work on it.

Except for its intolerance for mismanagement on and around the runway—giving it an awful ranking in the NTSB reports—we suspect buyers are comfortable with long-term Skylane ownership. For many, it's as far up the pecking order as they'll go in their flying careers.

These days, you can buy a 182 with a full G1000 glass panel and a luxe interior for a price in the high \$300Ks. A big investment, to be sure, but far less money (and far less speed) than a new Cirrus SR22, as one example.

### MODEL HISTORY

Wind the clock back to 1956 to reach the beginning of the 182 evolutionary history. The fact that it looks like a giant Skyhawk which itself looks like an inflated 150 shows that Cessna just did what it does best: It built on its experience with previous designs and

scaled them up. The 182 evolved from the 180 taildragger, so Cessna added the tri-gear, redesigned and relocated the exhaust and reworked the fuel vent system. Wet wings were used to hold fuel.

With the new gear, the 182 developed a nose-heavy tendency and Cessna never did sort this out.

Even new ones require deft trimming or the lazy pilot risks smashing the nosegear into the runway and crow hopping down the strip. It's not unusual to see an older 182 with repaired gear and firewall due to a nose prang.

***Skylanes are prized for short and rough airfield operation and deservedly so.***

When the airplane appeared in 1956, the average price was just under \$17,000. That's equivalent to about \$132,000 in 2010 dollars. Obviously, given the price of the 182T, aircraft prices have far outstripped inflation.

### CHECKLIST



Just about any Skylane can haul an impressive load.



You would be hard pressed to find a shop that can't work on a Cessna 182.



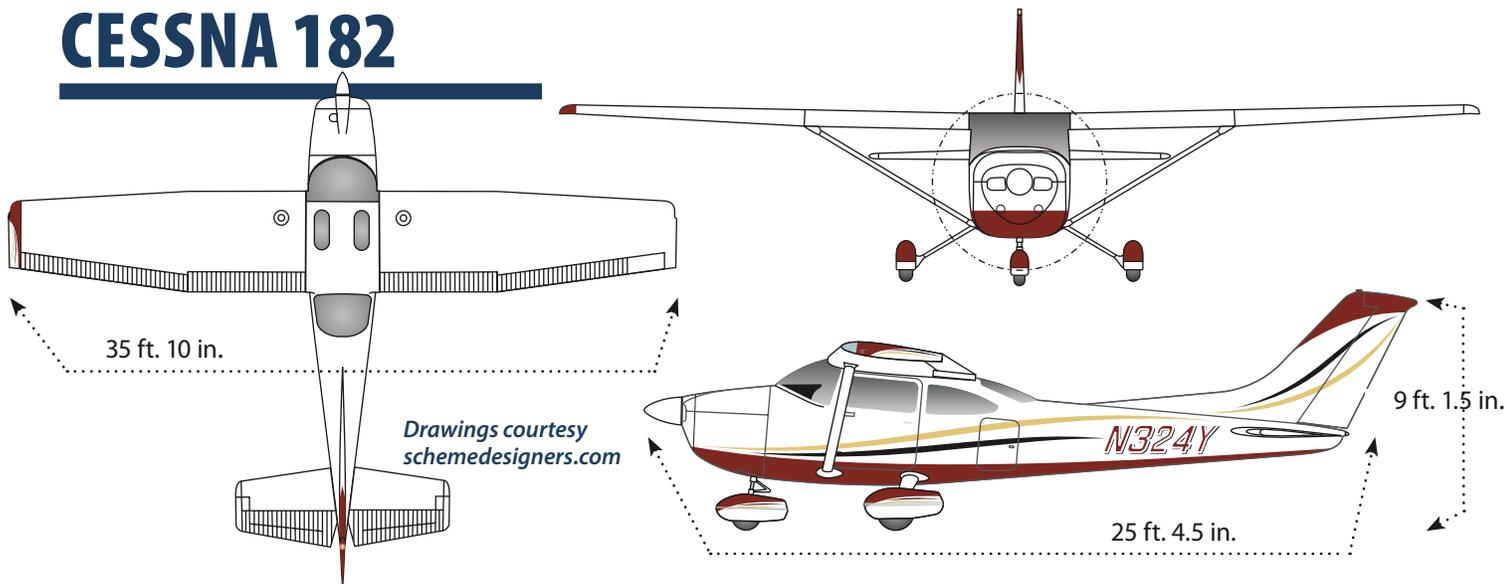
Expect speed? You won't find it in a 182. Later turbo models will only cruise in the mid-150-knot range.

In the first 182s, power was provided by a 230-HP Continental O-470-L, an engine that proved to be such a worthy choice that some variant of it was retained until the airplane went out of production in 1986. The engine remains easily overhaulable, for prices under \$30,000.

With its straight tail and windowless back, the original 182 looks like an antique, but Cessna soon sleeked it up with a rakish tailfin and the classic rear window everyone loves. Gross weight was 2550 pounds, compared to the modern Skylane max takeoff weight of 3110 pounds. (More on that later.)

Cessna embarked upon a con-

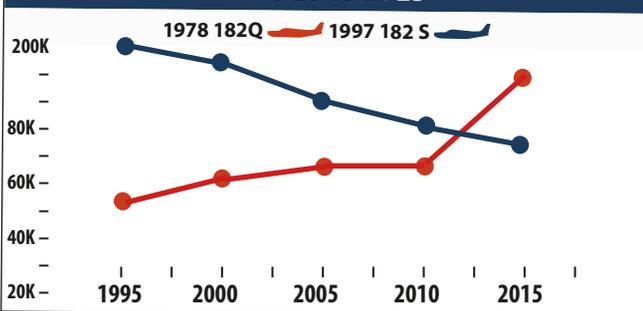
# CESSNA 182



## CESSNA 182 SELECT MODEL HISTORY

MODEL YEAR	ENGINE	TBO	OVERHAUL	FUEL	USEFUL LOAD	CRUISE	TYPICAL RETAIL
1956-1959 182 A,B	CONT 230-HP O-470-L	1500	\$25,000	55	1010 LBS	117-120 KTS	±\$31,000
1960-1965 182 C-H	CONT 230-HP O-470-L	1500	\$25,000	65-84	1090-1190	123 KTS	±\$34,000
1966-69 182 J-M	CONT 230-HP O-470-R	1500	\$25,000	65-84	1175	123 KTS	±\$41,000
1970-1971 182 N	CONT 230-HP O-470-R	1500	\$25,000	65-84	1310	121 KTS	±\$44,000
1972-1974 182 P	CONT 230-HP O-470-R	1500	\$25,000	61-80	1169	123 KTS	±\$46,000
1975-1976 182 PII	CONT 230-HP O-470-S	1500	\$25,000	61-80	1169	125 KTS	±\$57,000
1977-1980 182 QII	CONT 230-HP O-470-U	2000	\$25,000	61-80	1169-1390	121 KTS	±\$70,000
1981-1986 182 RII	CONT 230-HP O-470-U	2000	\$25,000	92	1373	124 KTS	±\$84,000
1981-1985 T-182 RII	LYC 235-HP O-540-L3C5D	2000	\$30,000	92	1319	157 KTS	±\$85,000
1997-2000 182 S	LYC 230-HP IO-540AB1A5	2000	\$35,000	88	1210	140 KTS	±\$140,000
2001-2005 182 T	LYC 230-HP IO-540AB1A5	2000	\$35,000	92	1025	140 KTS	±\$160,000
2001-2005 T182 T	LYC 235-HP TIO-540-AK1A	2000	\$40,000	92	1025	159 KTS	±190,000
2006-2009 182 T	LYC 230-HP IO-540AB1A5	2000	\$35,000	92	1130	145 KTS	±\$280,000
2006-2009 T182 T	LYC 235-HP TIO-540-AK1A	2000	\$40,000	92	1025	159 KTS	±\$375,000
2009-2013 182 T	LYC 230-HP IO-540-AB1A5	2000	\$35,000	92	1025	159 KTS	±\$360,000

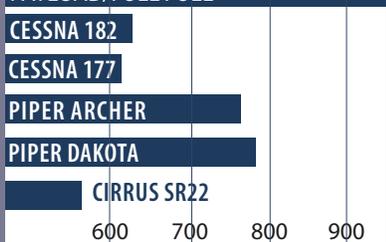
### RESALE VALUES



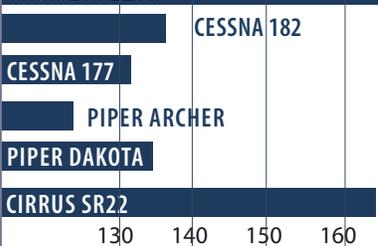
### SELECT RECENT ADS (S-MODEL)

- AD 08-26-10 ALTERNATE AIR SELECTOR VALVE
- AD 07-05-10 SEAT BACK LOCK ASSEMBLIES
- AD 04-15-10 BENDIX/KING KAP140 AUTOPILOT
- AD 98-16-04 SPAR CAP ANGLE STIFFENER INSPECTION

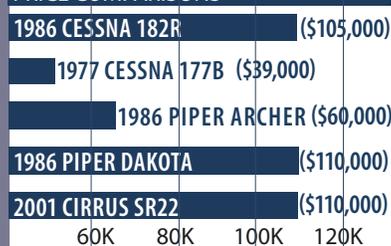
### PAYLOAD/FULL FUEL



### CRUISE SPEEDS



### PRICE COMPARISONS





*These three panel configurations represent the used Skylane market. That's a 182S, top, with latest-gen retrofit Garmin and Aspen mixed with OEM BendixKing from early 2000. A steam gauge 182N, middle, has older Silver Crown, a GNS430 and a custom panel. Be careful with early G1000 suites, bottom. They may not have WAAS.*



a 100-pound higher gross weight. In 1958, the Skylane name was applied—prior to this, the airplane was simply called the 182—and a deluxe version with wheel pants, standard radios and full paint instead of the trim-over-bare aluminum of the basic 182.



The 182B, with cowl flaps, came out in 1959. A swept tail was added in 1960 to make the 182C; it was basically a styling move, since the swept tail degraded spin recovery and reduced rudder power. The gear continued to be a problem, so in 1961, it was lowered again, by another 4 inches, on the 182D.

As it did with other models, Cessna put a rear window (Omni-

tioning improvement program, introducing new model designations every couple of years. The 182A saw redesigned gear with a wider track and a lower stance, with the mains 4 inches shorter and the nose gear 2 inches shorter. The 182A got an external baggage door and

Vision) on the airplane in 1962, with the 182E. This airplane was a significant upgrade over the earlier 182s and these are often thought of as “modern” Skylanes. The fuselage was widened four inches and the cabin floor lowered by nearly one inch to make more interior room.

Electric flaps became standard, the panel layout was updated and the adjustable stabilizer of the original gave way to a trim tab. The gear was beefed up (again) and the gross weight was boosted to 2800 pounds. A different engine variant, the O-470-R, was fitted. The 182E also had a redesigned fuel system, with bladders and the availability of auxiliary fuel, which raised capacity to 84 gallons.

Cessna also made changes that weren't as obvious. To save weight, it used thinner aluminum for the skins and converted from sheet aluminum to roll aluminum, which was cheaper.

That also yielded an airplane with more surface imperfections, which ended the days of polished metal airplanes. Full paint jobs became standard, to hide the dimples. The new airplanes were only 10 pounds heavier than the old ones but performance actually suffered, with reduced climb, takeoff performance and service ceiling.

The 1963 182F sported a thicker, one-piece windshield and back window, a standard T-panel and an increase in horizontal stabilizer span of 10 inches. Flap pre-select also became standard. From the F model forward, until the S arrived in 1997, changes were less dramatic. The G model had an available kiddie seat for the baggage bay, while the 182H got an alternator to replace the generator.

### **TURBOCHARGING, NEW ERA**

The next significant upgrade was with the 1970 182N model. Gross weight was increased to 2950 pounds and the spring-steel gear was swapped for tapered tubular steel legs that al-

lowed more fore-and-aft movement.

Track was widened again, to 13.5 feet, improving ground handling somewhat. In 1972, a leading-edge cuff was added to the wing to improve low-speed handling, resulting in the 182P, a variant that stayed in production through 1976. The dorsal fin was extended and the cowling was shock mounted.

In 1981, the 182R got another gross weight boost to 3100 pounds, and an increase in standard fuel capacity, to 88 gallons, stored in wet wings. The bladders, which had been a problem, were dropped in 1978. Cessna also switched over to a 28-volt electrical system. A turbocharged version was added to the line in 1981, the T-182R11, powered by a Lycoming O-540 producing 235 HP. Production ended in 1986 with the 182R.

In 1997, when Cessna re-entered the market, it introduced a newly retooled Skylane for the next century. The changes were substantial, some cosmetic, some not. The biggest change was dropping the reliable O-470 for a 230-HP Lycoming IO-540-AB1A5; no surprise there, since Cessna and Lycoming share the same parent company, Textron.

But the change improved one thing. The O-470s were quite susceptible to carb icing and the injected Lycoming solved that. But like the O-470, the Lycoming is a bit of a fuel hog.

Further, the Lycs are known for lurching cams at the mid-time point, which the TCM engines don't typically do. Also, the Continental is a smoother-running engine, in our view.

Cosmetically, Cessna did away with the old Royalite instrument panels, replacing them with painted metal. The interior—seats and cabin panels—is much improved, as is the instrumentation. Interior surfaces are now treated with epoxy-based anti-corrosion materials.

The latest 182 also has sealed wet wings, not bladders, making us wonder if owners will encounter leaks as the sealants age, as happens to Mooney owners. To get water out of the system, the airplane has no fewer than 12 separate drains, five on each wing tank and two at the bottom of the cowling. Although gross weight of the airplane is 3100

*A late-model Skylane interior, top photo, is a comfortable and modern dwelling with decent soundproofing. The Peterson King Katmai conversion, bottom, is a pricey, but good way to equip an older Skylane for backwoods missions.*

pounds, its typical empty weight is substantially higher than earlier models so it carries less than, say, an early 1980s R11. Speedwise, the normally aspirated model is respectable, cruising at just under 140 knots on 16 to 17 GPH. One reader told us the turbocharged 182 is capable of the mid-160 knots in the teens.

Maintenance wise, the 182S has proven the target of a number of Cessna service bulletins, with most of the work being covered under warranty. Thus far, we've heard no significant beefs related to unusual maintenance problems. The BendixKing avionics in the new Skylane (172 and 206, too) turned out to be hugely problematic. So much so that Cessna eventually switched to Garmin's G1000 and never looked back.

Cessna teased the market with the \$530,000 182 JT-A diesel-engine model, but last spring put the program on hold indefinitely. Test aircraft have flown with the 227-horsepower SMA SR305 turbocharged engine, but a turbocharger failure (resulting in an off-field landing) seemed to be the beginning of Cessna's FAA certification troubles. Worth noting is this engine has operated pretty well under European approval.

Textron currently offers the



G1000-equipped 182T at a base price of around \$480,000.

## MARKET SURVEY

The market may have been more well delineated when the 182 appeared but it's a jumble now. There are so many used and new airplanes available, it's hard to know what to compare the 182 to. The Skylane still offers lots of interior space and an unusually flexible payload/range combination that explains its enduring appeal.

Late-model Skylanes have depreciated to the point that a 1997 S model can be had for \$135,000 or less. That's a good value when you consider that one 10 years older—a lesser airplane, in our view—sells for roughly half that.

For equivalent capability, buyers may or may not favor Cessnas over Pipers. An average-equipped 1979 Skylane will fetch about \$71,000



*Clean N-model Skylanes, top, can sell for around \$45,000. Engine access is easy with the upper and lower cowling removed, bottom photo.*

the ADS-B position source dilemma, since WAAS is required.

If you're going older, most buyers seeking a practical,

use-it-often airplane won't want a museum piece, so that argues for a 182E or later. If your budget allows up to \$90,000, the 1981 T-182 strikes us as a better combination of speed, value and hauling ability than any other airplane we can think of. You might have to invest in modern avionics, or ones to your liking. This could run an additional \$50,000—or more—for a ground-up upgrade.

### PERFORMANCE, HANDLING

If fast is your mantra, the Skylane won't be your airplane. Flogged to the limit, these are 135-knot airplanes, but more like 130 knots burning about 12 GPH. Range varies with year and tankage, of course, but typically, you can easily fly 900 still-air miles in the 88-gallon versions. That's more endurance than most owners can muster.

Skylanes are prized for short and rough field ops and deservedly so. Long-time reader David T. Chuljian flogs his L-Model 'Lane into the Idaho outback with good results.

The prop is well clear of the ground and the gear is high enough to keep antennas out of the muck. If need be, the wheelpants can be removed. But still, it ain't no traildragger. The nosegear will take some hits on rough strips.

A late-model 182 will get over a 50-foot obstacle in only 1115 feet; add a third more for safety margin and you're still comfortably under 2000 feet. Initial rate of climb is good, thanks to the high horsepower, but it was better in the early

models than the later ones, thanks to significantly higher gross weights.

But later models—the 182P and forward—have greater fuel capacity and higher gross weights and thus offer more loading/range flexibility. This, more than any other factor, makes the Skylane a first choice as a family airplane. It's not much good to blaze along at 160 knots if you can only carry three people.

Although the CG range in the 182 series is adequate, the airplanes tend toward forward CG; ballast or bags in the baggage compartment help. Speaking of which, the baggage compartment is large and easily accessible through an exterior door. (The seals, when old, may leak and should be replaced.)

Handling? We're not talking BMW-like. The 182 is a big, stable airplane and it takes some effort to break it loose from anything other than straight and level. And even if you do, its draggy profile means that speed builds slowly enough that only a somnambulant pilot could lose it in a dive. The Skylane is heavy in pitch, so timely trimming is a must, especially prior to or during the landing flare. Get lazy in the flare and the Skylane can slam the nosegear onto the pavement, buckling the firewall and leading to a huge repair bill. Roll forces in the 182 are nothing unusual; think of a Skyhawk with stiff cables. In a turn, the Skylane will want to overbank if left alone but so slowly that you should never get behind it.

As far as roll trim goes, fuel load and balance are important in the 182, particularly in airplanes with long-range tanks. The fuel system will self-siphon between tanks if the airplane is not parked on a level surface, so it's possible to have an imbalance that won't improve in flight. Even Cessna's excellent L-R-Both fuel selector won't prevent the tanks from draining at different rates unless a single tank is selected.

Transitioning from a Piper or smaller Cessna to a Skylane is a Ralph Kramden experience: You'll definitely feel like a bus driver, albeit a regal one. The seats are high and upright and relatively comfortable. Although visibility is good forward and out the windows, the panel and glareshield are tall, requiring short pilots to use a booster seat. Heating



while an early 1980s Piper Dakota has held its value, bringing as much as \$110,000, despite the fact the Cessna cost less when new.

Which Skylane model? That depends on your budget. As noted, the latest models have started their depreciation slide and are looking to be better values than ever. These are well-equipped airplanes and are quieter and more comfortable than the earlier Skylanes.

For a real steal, look for 2005 models with G1000 suites for prices in the mid-\$170Ks or less. But *caveat emptor*. Some aircraft haven't been upgraded to WAAS (the upgrade cost is staggering), creating several problems, including the ability to shoot a modern GPS approach, plus

is good for the front-seat passengers, less so for the rear. Wing root vents provide plenty of ventilation but also leak air during the winter, leading some pilots to tape the inlets. Cessna fixed this in the newest Skylanes, which are tight, quiet and warm.

## ENGINE, MAINTENANCE

In all of general aviation, there are perhaps a handful of engine-airframe combinations that are nearly perfect. The 182/O-470 pairing is one of them. Four variants of the engine were used, the L, R, S and U. The S (1975-1976) has been the most troublesome because of its revised piston ring configuration, intended to cope with the introduction of low-lead fuel. The U variant (1977-on) is desirable because of a 2000-hour TBO, though earlier engines are upgradeable from their 1500-hour TBO. It's a rare Continental that makes it to TBO without some form of top overhaul but as big displacement engines go, the O-470 is more likely than most to get by without a top.

Because of its high population and simplicity, the O-470 series is relatively inexpensive to overhaul. One persistent weakness of the design, however, is the tendency of the carburetor to ice up. In carb ice conditions, you have to be on your toes in using carb heat—the accident history shows this.

In its singles, Cessna wisely adhered to the KISS theory for the fuel system. But early models still had their problems. The bladder fuel systems found on 1962 to 1977 Skylanes didn't fit well in the wing bays, resulting in the possible formation of a diagonal wrinkle across the bottom of the bladder. Combine that with water leaks due to deteriorated O-rings in the flush fuel caps and you can see the problem; the wrinkle acts as a dam to trap water that the pilot couldn't remove during pre-flight sumping. On rotation, the water would spill over the wrinkle, reach the fuel pick-up and choke the engine on climbout.

The FAA's response (AD 84-10-01) was to mandate the installation of additional drains and the inspection of the bladders for wrinkles. This is better known as the "rock-and-roll" AD, for it also directed pilots of airplanes not so modified

to go out to the wingtip and shake it up and down to get the water to slosh over the wrinkles. This Marx Brothers-like procedure is certain to cause serious doubt in the minds of nervous passengers.

Otherwise, the Skylane is relatively free of serious ADs. A few have cropped up recently, but they're one-time directives. AD 98-1-14 calls for replacement of mufflers; 98-1-1 mandates inspection and possible replacement of the alternate static air valve. Also of note are 97-21-2, inspection of certain cylinder installations, 97-15-1, replacement of specified cylinders and 96-12-22, recurrent inspection of the oil filter adapter.

More recently, Continental had issues with valve lifters coming apart and these impacted some O-470s. On page 25, we've published a summary of ADs against the S-model Skylane. Although the number is seemingly large, none are especially onerous.

## MODS, CLUBS

The Skylane may hold the record for having the most modifications available and many of them are good. The big ticket items are engines, replacing the stock O-470 with a Continental O-520 or IO-550, another TCM product with a good reputation. P.Ponk does the 520, contact pponk.com or 360-629-4812. Peterson Performance Plus (katmai-kenai.com) offers an impressive STOL package, including the full-up King Katmai mod (we covered it in the January 2013 issue of *Aviation Consumer*), plus O-470 engine upgrades.

Air Plains (airplains.com, 800-752-8481) does O-520 and O-550 conversions for the Skylane. For another STOL package, see Sierra Industries at sijet.com or 830-278-4481. Texas Skyways offers the O-550 upgrade; check them out at txskyways.com or 800-899-7597.

There is the Horton Flight Bonus speed package; contact 800-835-2051 or stolcraft.com. More speed mods are available from Knots2U at knots2u.net or 262-763-5100 and Maple Leaf Aviation at 204-728-7618 aircraftspeedmods.ca. Met-Co-Aire has drag reducing wingtips; see metcoaire.com and phone 800-814-2697. If you want to slow down instead of speed up, contact Precise

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## ACCIDENT SCAN: LANDING PRANGS

If you've ever practiced balked landings in a Skylane, you know how critical it is to keep the heavy nose down when transitioning out of the flare and into climb when configured with flaps, nose-up trim and full power. Our recent scan of 100 recent wrecks proved that Skylane pilots might benefit from more practice for these situations.

That's because a whopping 47 percent of the 182 wrecks that made the NTSB reports fell into the RLOC, or runway loss of control, category. Our research became monotonous with an ugly pattern of landings gone bad, resulting in busted nose-wheels, bent firewalls and twisted airframe structure. While some were benign prangs that resulted from not managing the flare, touchdown, crosswinds or simply not maintaining directional control, other landings were downright out of control, resulting in fatalities. These contributed to a total of 16 fatal crashes in our random research.

Sometimes practice didn't help, as was the case with one pilot who told the NTSB he conducted several hundred takeoffs and landings at the accident airport over the past several years. He sadly lost a passenger on a botched go-around. Another 182 pilot botched the go-around so badly that he allowed the airplane to stall, followed by the left wing striking the edge of the runway and resultant inverted tumble into an adjacent field. The surviving passenger told the NTSB that the touchdown was "rough". Accurate statement.

Speaking of rough, there were far too many NTSB reports with this wording as the probable cause: "The pilot said that the airplane touched down and then became airborne again and began to porpoise. The pilot tried to regain control and stop the induced pitch oscillations, but landed hard on the nose gear, substantially damaging the firewall."

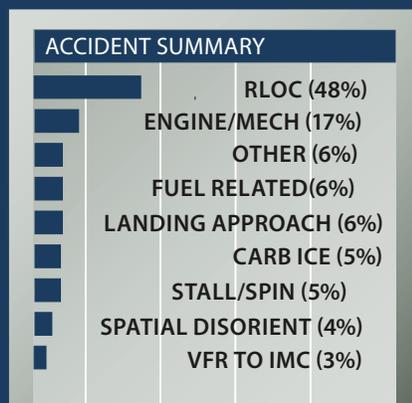
Engine trouble was the runner-up category, at 17 percent. We found multiple reports of engine failures

from undetermined causes, while others were revealing. In one 182C crash, a post-accident examination of the engine turned up a piece of engine isolator gasket which became wrapped around the carburetor main fuel jet, while both magnetos' distribution gear had cracked and were missing teeth. The NTSB determined the damage was related to engine backfire. Another 182 engine seized from loss of lubrication after the oil suction screen became clogged with debris, which included fractured portions of piston rings.

Despite the relative simplicity of a Skylane fuel system, a couple of pilots managed to take off with the selector in the wrong position. Still, several pilots learned that no matter how simple the fuel system is, if you burn all the fuel in the tanks, the engine will eventually quit.

We threw eight wrecks into the ambiguous "other" category, including a takeoff crash blamed on a clogged pitot tube, a hand-propping gone bad (it went into the side of a hangar, actually), a run-in with a bull during the takeoff roll in rural Arizona, plus a couple of wrecks which might have been avoided if pilots would have waited until the aircraft was parked before getting drunk.

There were also a handful of carb icing events, where pilots waited too long to apply carb heat. But perhaps the saddest of them all was the fearless student pilot who should have waited longer before launching into IMC. Like most 182 wrecks, that was no fault of the aircraft.



Flight ([preciseflight.com](http://preciseflight.com) or 800-547-2558) for a speed brake kit. Vortex generators are available from Micro Aerodynamics at 800-677-2370 or [microaero.com](http://microaero.com).

If six hours of endurance isn't enough, see Monarch Air and Development for aux tanks and improved fuel systems. For more aux tanks, see Flint Aero ([flintaero.com](http://flintaero.com) and 619-448-1551) and O&N at [onaircraft.com](http://onaircraft.com) or 570-945-3769. Last, don't forget props from Hartzell; three-blade conversions are available. See [www.hartzellprop.com](http://www.hartzellprop.com) or 937-778-4200.

There are a couple of Cessna groups. We highly recommend the Cessna Pilots Association, 805-934-0493 and on the web at [www.cessna.org](http://www.cessna.org) as the first stop in obtaining information before purchasing a Skylane. These guys have been at it for years and know the brand well. Find more support at the Cessna Owner Organization at 800-313-0582 or [www.cessnaowner.org](http://www.cessnaowner.org).

### OWNER FEEDBACK

I have owned my 1981 Skylane II for 20 years. It is the R model with 3100-pound gross weight and wet wing fuel tanks (92 gallons useful). It has 2100 hours with original paint and interior. I really like the look of the small vertical empennage registration numbers, allowing a fuselage paint scheme uninterrupted by large ones.

The aircraft has been a Midwest and Montana aircraft, hangared for life, resulting in a corrosion-free airframe, inside and out. The only mods I added were a Garmin GNS530, an S-Tec 30ALT standalone altitude hold autopilot and the conversion of the battery to the gas recombinant type.

The altitude-hold system is a wonderful addition because the aircraft demands attention when hand-flying assigned altitudes during instrument flight.

The O-470U engine was replaced with a factory remanufactured replacement about 350 hours ago. It has strong cylinder pressure and almost zero oil consumption. I attribute some of this to always preheating the engine when it's below 50 degrees, plus my use of AvBlend oil additive at each oil change. For the last 15 years I have participated in

the annual inspection process, resulting in personal insight and knowledge of the aircraft and systems, in addition to saving a little on the labor cost. Annuals are about \$1000, and my insurance premium is also roughly \$1000.

Maintenance items over the years include rebuilding the exhaust system and replacing the air induction ducting system between the filter and carburetor. I also replaced the flush-style fuel filler caps with the umbrella style, preventing rain water ingestion around the seals.

Cowl flap hinges develop wear, requiring replacement to prevent inadvertent departure from the aircraft. All the rubber fuel tank connections have been replaced, as have the cowl fasteners with stainless hardware.

I think 182R ownership is made easier because it is basically the same airframe as being manufactured today. Parts are available from Cessna and other sources.

I usually operate the engine at 2400 RPM and 20 inches of MP. This results in a true airspeed of 125 knots at 5000 feet, burning about 12 GPH leaned to 50 degrees on the rich side of peak EGT.

One thing to remember about the 182 is the potential for carburetor icing, made easier with a standard carburetor venturi temp gauge. Another thing I learned early on was to aggressively lean the carburetor during all ground operations to prevent a rich idle mixture.

The aircraft is an excellent hauler with an empty weight of 1829 pounds as configured. Landings are made shorter with 40 degrees of flaps, when required, but you might want to add a bit of power in the flare just before touchdown when using full flaps. Those landings can then be greased just like the other flap settings.

Arthur Sundeen  
via email

I was a first-time plane buyer in spring of 1998. While I had gotten my pilot certificate as a teenager in 1971, I had not flown since 1973.

As a low-time pilot I needed simplicity, and for commuting I needed speed, dispatch reliability and some-weather-flying capability. Since I like small airfields and dirt strips,

good prop clearance and good short field performance was wanted. As I would be taking it all over the U.S., I wanted any mechanic to be able to take care of it.

As I would be taking friends and family, I needed four seats. As I had some money (but not a lot), I needed a plane that was affordable to acquire and operate. All in, this is a perfect specification for a legacy Cessna 182. I ultimately purchased N9339G, a 1972 P-model. After new paint and interior, it's now N314PY.

An instrument, commercial and multi-engine rated pilot, I initially flew it 200 hours per year, but for the past eight years I average around 100 hours per year flying it most weekends, including traveling with my wife to visit friends. Other times I fly to practice instrument approaches or basic airmanship. I still have not gotten tired of steep turns, stalls or precision power-off landings in this airplane.

As I have been using the plane fairly seriously, I have slowly been upgrading. It is now a particularly capable 182, especially with the Texas Skyways O-550 engine upgrade. At 5000 to 8000 feet, it burns 15 GPH (ROP) at 145 knots true. At 17,500 feet I see 9 GPH and 115 knots true. This is useful when heading east. The aircraft has tremendous high density altitude performance.

With the 40 degrees of flaps and the AoA system, plus the 182's fat wing, I can fly it safely at 50 knots. This makes getting in and out of 1500-foot airfields comfortable. Perhaps a better pilot could reliably go even shorter.

The aircraft has Flint extended range fuel tanks in the last internal wing bay, for a total of 102 gallons usable, instead of 79. The additional two hours of endurance adds utility.

During a major avionics upgrade, I had all the 1972 vintage wiring removed and replaced with modern wires and pullable circuit breakers, in addition to replacing all of the antennas, signal cable and connectors—beautifully done and reliable, too. I also added a 70-amp alternator.

Avionics mods include a Garmin GNS530W, SL30, S-Tec 30, Angle of Attack system, Avidyne EX500 MFD with approach charting, TAS

*continued on page 32*



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## Used Cessna 182

(continued from page 31)

and TIS traffic systems, EDM800 engine monitor, Aspen PFD with synthetic vision. I don't recommend the \$2000-plus Aspen ESV software upgrade. It's just not engineered right to be useful, in my opinion.

The cowling and wingtip dual HID pulsating recognition lights are useful, however. When in continuous mode, they are plenty bright enough to land at unlighted fields.

The aircraft has a TKC deicing system. It's not approved for known icing, of course, but it enables me to fly through New England all winter with just the occasional cancellation—something you can't otherwise do. As the TKS fuel tank make access to the empennage difficult, I had a DER approve a rear access panel.

My longest nonstop trip in N314PY was 10.5 hours from Flagstaff, Arizona, to Teterboro, New Jersey. This included two picnics at 17,500 feet and three restroom breaks (the 182 gives lots of space for easy maneuvering inside.) I landed with 45 minutes of fuel remaining.

My longest wander was two weeks as far north as I could still find drums of 100LL. I made it to Resolute, Pond Inlet and Qikiqtarjuaq.

I now fly without the wheel pants installed. I like the improved view (one of the benefits of a high wing, in addition to easier access and staying out of the rain), and maybe take a one- to two-knot hit.

As you can see, sort of everything about this 182 has been swapped/replaced/improved. The airframe is clean and I treat it with Corrosion X every other year to keep it that way.

I can't think of any downside to my Skylane. I fly it at night, in weather, with passengers—although though not all three simultaneously. Like any plane, you have to keep up with maintenance. That's not cheap, but as most every mechanic can work on a 182, it is about as reasonable as an airplane can be.

My honest all-in cost is \$18,000 for the first hour of the year. Insurance is \$2900 for \$170,000 on the hull and \$1 million smooth through USAIG, and brokered by Sutton James in Connecticut. My hangar is \$4500 per year, oil and small stuff is \$1000, annual inspections around



*William Kahn had a total refurbishment done on his 1972 P-model, including a custom panel and all new wiring, left. It also has TKS and extended range fuel tanks.*

### FEEDBACK WANTED

## PIPER SENECA



For the April 2016 issue of *Aviation Consumer*, our Used Aircraft Guide will be on the Piper Seneca. We want to know what it's like to own these twins, 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 (full-size, high-resolution) you'd like to share to the email below. We welcome information on mods, support organizations or any other comments. Send correspondence on the Piper Seneca by February 1, 2016, to:

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

\$2000, capital costs are around \$5000. Then there are database upgrades at \$1000-plus, \$1000 for training, plus imperative magazines like *Aviation Consumer*. After all that, add \$125 per hour—\$75 for gas and \$25 for engine and prop reserve.

If I had known for real how much plane ownership would really cost (I think real all-in cost for my annual 100 hours is \$30,000) I would not have bought the plane.

But, if I had known how much I absolutely love everything about flying and owning the plane, I not only would for sure have gone ahead, but would have done so a decade earlier.

A legacy 182 is a fabulously balanced machine. I'm 18 years into this now and still loving it.

William Kahn  
via email