

Panel Work

Bringing form and function together for safe navigation

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Last month we did the time warp and discussed how to bring dated aircraft interiors into the 21st century. That's great if you're looking left, right, or behind you. However, if looking straight ahead in the cockpit brings you back to the 1970s, style may be the least of your concerns.

Aircraft panels have come a long way since the days of the first Cessna 172. Modern panels are a lesson in simplicity and organization. Form follows function, and that's the way it should be. I've often wondered how some of those old panel layouts came to be. Most are only a little quirky, generally adhering to the basic "T" instrument layout. However, there are many examples that can only have been the result of a very bad game of "pin the instrument on the panel."

Browse your local airport and you're likely to find that most aircraft could use some form of panel updating. Some aircraft may simply be in need of a little cosmetic work, while others could use a major cleanup or a serious avionics upgrade. Regardless of the amount of work to be done, panel work is not to be taken lightly.

Avionics are unique in the aircraft maintenance game simply because they are the most dynamic part of the aircraft. If you think about it, almost every other part of an aircraft is maintained with the goal of keeping the components within tolerance and as close to new as possible. When it's time for an engine overhaul, most owners don't have the option of shopping around for the latest new engine design to hit the market. Avionics, of course, are

another story. With new products for communication, navigation, engine monitoring, and in-flight entertainment arriving each year, even a simple radio replacement can be a complex decision.

Typical panel projects are driven by one or more of the following: the desire for cosmetic and ergonomic improvements, the repair or replacement of a failed instrument, or the desire to improve the capability of the aircraft.

The problem with most panel improvements is that it can be challenging to keep the project from growing into a complete avionics overhaul. This isn't simply because your

average radio shop is looking to turn every small project into a big one; it's quite the opposite.

Too often, avionics work becomes a struggle between the aircraft owner and the radio shop doing the work. The owner wants a simple radio

replacement, and the shop wants to "do things right" and avoid future problems due to bad wiring, antennas, etc.

This is a shame, because shops and owners are almost always trying to accomplish the same thing: Both want to improve the functionality and reliability of the aircraft. Let's examine a typical example.

During a recent flight, Paul finds that the number one comm radio (original to the aircraft) is no longer working in his 1972 Grumman Traveler. He brings it into the radio shop, hoping that a small adjustment or repair will be all it will need to solve the problem. Unfortunately, upon inspection the technician finds that the radio has failed components that are difficult to obtain and expensive to

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replace. Even if Paul chooses to repair the radio, there's no telling how much longer the radio will last.

So, after briefly mourning the loss of that new big-screen TV he was saving up for, Paul decides to take the plunge and buy a new digital radio. He figures the cost to be a few thousand dollars for the radio, plus installation. "It's not that simple," says the technician. "You've got a real rat's nest of wiring behind the panel. If you put a brand-new radio in there with 35-year-old wiring, antennas, and that ancient audio panel, you're just asking for more problems. I recommend a new audio panel, antennas, and extensive replacement of your wiring." After calculating the numbers, Paul decides to roll the dice rather than postpone retirement just to "do things right."

Only time will tell if it was the right call. Unfortunately, more often than not, keeping old wiring and equipment is a bad choice in the long run. Bad ground connections and old wiring can cause all sorts of future problems. And, the cost of tracking down and repairing these problems can quickly eclipse the original quote for the complete overhaul.

The good news is that there are some ways to reduce the high cost of avionics upgrades and still improve overall system reliability.

Let's go back to the three reasons that owners do panel upgrades to begin with. If everything is still working well, improving the esthetics and ergonomics of your panel can make a real difference in the value and safety of your aircraft. Start by looking at a few modern panels. You'll find they all have a few things in common. They all have a standard six-pack arrangement of flight instruments. The radios and transponder are typically grouped in a single center-stack and switches, fuses, circuit breakers, gauges, and warning lights are located in uniform, logical groups.

This is where the help of an expert can really come in handy. If you are dealing with a typical certificated air-

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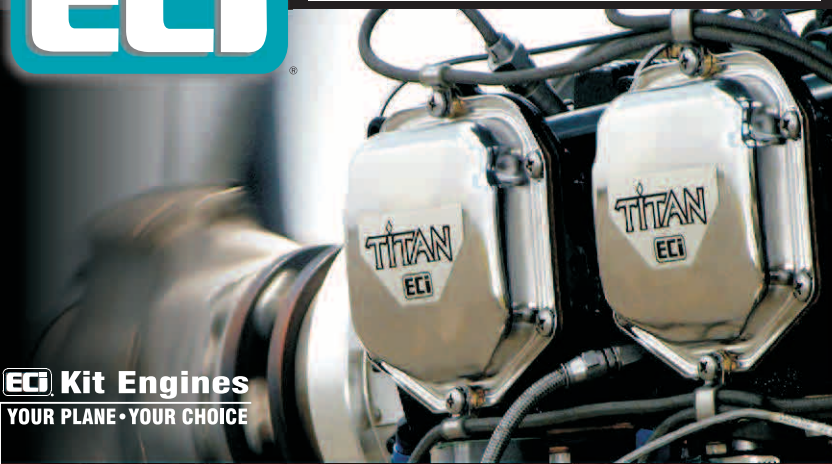
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craft, you will need to determine what can and can't be relocated without running into approval issues with the FAA. Depending on the aircraft, you may need to enlist the skills of both an airframe and powerplant (A&P)

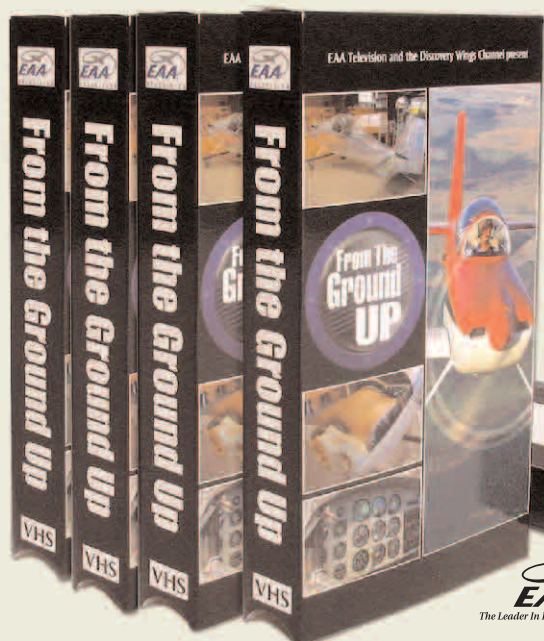
mechanic with an inspection authorization (IA) and an avionics technician to get the whole picture. Be sure to inquire about legality, complexity, and cost for every item you're considering. In some cases, moving a radio or an

instrument is a simple affair. But if the existing wiring harness is extensive and will not reach the new location, the move of a single instrument can be expensive.

This is also the time to consider

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Modern aircraft typically use flat, gray metal overlays with room for labels and placards in logical locations.

replacement of the instrument overlay. Almost all instrument panels consist of a structural sub-panel and a non-structural "overlay." The overlay is usually cosmetic, and until recently, contoured plastic was the material of choice. These days, most modern aircraft use a flat, gray metal overlay. This makes for a clean installation with room for labels and placards in logical locations. Best of all, replacement metal overlays are about the same price as the plastic ones. In addition, if one is not available for your aircraft, it isn't too hard to manufacture one. If you can't do it yourself, ask your local mechanic or machine shop for help. As a decorative component of the aircraft, overlay replacement should be considered a minor alteration and should not require an FAA form 337. Consult your mechanic to see if your aircraft's installation is considered preventive maintenance, a minor modification, or a major modification.

As described above, replacing a failed radio or other avionics component can lead to a much bigger project. In this case, it is important to do the most you can to ensure that you are building on a solid foundation. Old wiring does present significant problems with poor conductivity, bad grounds, signal loss, and other issues. If you cannot afford to fix the entire system, at least invest in the critical paths for your new avionics.

If you are installing a new radio or transponder, it pays to at least replace the major connectors, coaxial antenna cables, and antennas (if needed). There are a number of "slide-in replacement" radios available. However, if the connector at the back of your existing radio tray is worn and loose, it'll probably take a lot less time, trouble, and money in the long run to just replace the tray during initial installation.

In addition, if your audio panel is

old, you should consider having the radio shop remove, inspect, and clean the contacts at the same time as the radio installation. It's just one more link in the chain of typical radio problems. And, a little preventive maintenance can go a long way.

One way to save on your project is to purchase used rather than new avionics. This approach requires care to ensure you are not inheriting someone else's problem, though. Before taking this path, you'll need at least a basic education on the FAA "tagging" process.

First of all, any piece of avionics without a condition tag from a certified avionics repair station is a com-

Modern panels are a lesson in simplicity and organization.

plete unknown and cannot be legally installed in an aircraft until it has been inspected and tested by the manufacturer or a certified repair station. In fact, only the manufacturer can actually certify the instrument. Repair stations can only run tests and issue the appropriate release tag, noting the results of their inspection. And that's where things get complicated.

The basic tagging system is simple (sort of). A yellow tag indicates the instrument is legal for installation, based on whatever testing the repair station determined was appropriate for the device. This does not mean the unit is perfect in every way. In fact, it only means the device passed testing at the time of the inspection. For example, let's say you find a radio for sale with a yellow tag from 1990. It may be legal, but is it still in good working order after 16 years in someone's closet? You may also find radios for sale "as removed" with yellow tags (or labels) on the radio from its last installation.

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is that all yellow tags should include the repair station that issued the tag, as well as a reference to the work order. If you really want to learn about the condition of a radio, call the facility that issued the tag and ask to review the original work order. The work order will detail exactly what was tested and what the test results were. This is why it makes sense to purchase used avionics directly from the shop that issued the yellow tag in the first place. In most cases, you will get the whole story in one stop and even get a basic warranty with the unit.

In case you're wondering about the other tags, two other colors are used in the FAA tagging system. A green tag indicates the unit is not currently legal for installation, but it's considered repairable by the facility issuing the tag. If using yellow to mean good and green to mean beware seems odd

to you, you haven't worked with the FAA long enough.

Finally, there is the red tag. Fortunately, the meaning of this color is logical. Red tags indicate the unit is not repairable.

If you are making big changes, such as adding a Garmin 430/530, MX20, or complete panel makeover, some excellent panel-planning tools are available to help with the project. Both Panel Planner (www.PanelPlanner.com) and ePanel Builder (www.ePanelBuilder.com) offer cost-effective tools for laying out your new instrument panel. And, both systems allow you to transfer the final design to a computer-aided design (CAD) file that can be used to actually produce the final product. For a more traditional approach to panel planning, most avionics shops have full-size templates you can use to test the look and func-

tionality of different avionics arrangements. Most likely, you will have to provide a full-scale drawing of your panel, but the avionics shop can help with the actual locating of the instruments.

Whatever the scale of your avionics project, the most important thing is to improve the reliability and safety of your aircraft. As with other aircraft maintenance projects, it's not always what you see that counts. Take your time, evaluate all of your options, and work together with your avionics shop to develop a solution that will keep you flying without grounding your budget!

Jeff Simon is the president of Approach Aviation, a provider of educational products, tools, and supplies for aircraft owners. To learn more, visit Approach Aviation at www.ApproachAviation.com or call, toll-free, 877- 564-4457. EAA



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