Avionics and Re-Sale

PHOTO COURTESY OF AVIDYNE

SPOT THE DIFFERENCE, CESSNA 414 PFD UPGRADE BEFORE (TOP) AND AFTER.

Every day you'll likely come across media selling services that promote checking the history of the used car you are looking to buy. If that message - subliminally or otherwise - has been pummeled into your conscious, it should be all the more at the forefront of your thinking when you check the history of a used aircraft! Given that the average price of a used car pales into insignificance compared to a used aircraft, proper research could save you the equivalent of a few horseless carriages.

Due diligence on the aircraft's records, log-books, engine and maintenance histories are all very important areas for research, and here, we will focus on the avionics component. We'll consider the pre-purchase inspection, cockpit avionics, cost-effective upgrades to make your aircraft more attractive to sell, and finally a selection of potential problems you could face if the appropriate measures are not put in place as a buyer or as a seller.

THE PRE-PURCHASE INSPECTION

The premise that "nothing can substitute experience" is a good start when talking about the pre-purchase inspection. Having been involved in numerous pre-purchase inspections on all types of aircraft at many different facilities, I surmised one common element; they are all different.

There is also a 'human' factor that arises during this process; the buyer and the seller have particular objectives that influence the person performing the inspection, and they act like a perpetual seesaw. In most cases, the seller is a professional who represents the owner and the aircraft in good faith, but there are circumstances where the seller can

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Plane Sense on Cockpit Avionics

Whether buying or selling, the right avionics package could seal the deal! **by Brian Wilson**

take a "let's see if they catch it" approach to a potential problem.

Simply stated, the seller doesn't want to add cost to the aircraft, and the buyer wants to ensure they are purchasing a fully functioning avionics suite. The buyer and seller should work together to agree on a facility they are comfortable with to perform this all-important inspection.

When looking for an appropriate avionics shop, start with one that has experience on the particular type of aircraft for sale, one that has a formal pre-purchase inspection to hand.

Both parties should review, and agree on the shop's formal inspection criteria. At the very least, the inspection should include a functional test of all the cockpit, cabin and peripheral avionics systems. Visual inspections of the aircraft's antennas, pitot probes, static ports, static wicks and angle of attack vanes should also be performed and documented.

I cannot emphasize enough the importance of having a detailed inspection form; one that has all the proper documentation. Start out by listing all the aircraft information including the tail number, serial number, times and landings. All line items should have an entry whether the system was tested or not.

Do not accept a check mark next to the system's nomenclature; insist on a "pass" or "fail" entry or "non-applicable" if the system noted is not in the aircraft. A failed entry should be substantiated by a detailed explanation as to how the system failed the test. Make sure the technician who performed the inspection signs and dates the document as well as the facility's Quality Assurance representative, and if you can't read the names, ask them to print their names below the signature.

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REMOVAL OF ELECTRO-MECHANICAL INSTRUMENTS FOR GLASS COCKPIT EQUIPMENT CAN ONLY BE GOOD

For those on the buying side, the following information is vital and will save you time and money:

- Make sure the seller has two (2) sets of wiring diagrams, one (1) from the Original Equipment Manufacturer (OEM) and one (1) that includes all the supplements. The supplement contains all the avionics systems that were installed after the aircraft left the assembly line - for an aircraft 10-20 years old or more, this could be extensive.
- Have the technician confirm that the systems that are in the aircraft match what is in the supplement.
- Most inspection forms don't have a line item for this procedure, and the seller usually doesn't want to pay to have this done. *If you take anything from this article, remember to have this research done, and insist that the seller provides this documentation including any structural modification drawings.*

SPECIFICS ON COCKPIT AVIONICS

The cockpit or flight deck is the area from which the crew controls most of the avionics systems on an aircraft, and the configurations are somewhat standard per model when first built. However, upgrades over the life of the aircraft can be subtle or extreme. In the case of a jet or turboprop where the modifications were extreme, this can have a positive or negative overall effect.

One example of a good upgrade would be the removal of the Electro-mechanical instruments and the installation of a state-of-the-art Glass cockpit performed and substantiated by proper documentation. Let's turn the tables though; and although you have a glass cockpit and proper documentation, the instruments are a first generation era that are no longer supported by the manufacturer. Alternatively, this aircraft might have been one of only a few modified with this configuration.

The same could be said for the Flight Management Systems (FMS). It might sound nice that the aircraft has dual FMS' on-board, but the reality is quite different if they are first generation, and have no viable upgrade path. Remember, these units are configured with software and hardware, including microprocessors and memory chips. Many of these systems are 5-10 years old or more; would you buy a 5 or 10-year-old laptop?

Another issue to have materialized over the last few years involves some operators who are upgrading their Part 25 aircraft with Part 23 equipment. Do you think a component designed to work within the flight characteristics and equipment on-board a King Air should be installed in a Gulfstream?

Before the technician starts testing the systems, they should do a visual check to identify bent or broken knobs, lenses or faceplates that are scratched or cracked, and instruments that are not seated correctly or not secured. Special test equipment is required to perform the functional checks, and not all the avionics facilities have the proper equipment that is needed to perform all of these.

The altimetry system should always be checked for accuracy, and the plumbing leak tested. A simulated coupled approach for the Flight Director and Autopilot, and target accuracy of the Traffic Collision Avoidance System (TCAS) are other examples where sophisticated equipment is needed.

Most new aircraft that are outfitted with a Glass cockpit allow technicians to access a diagnostics page that records system fault histories on the last flight and many preceding legs. The diagnostics codes should always be reviewed and deciphered to possibly reveal ongoing intermittent problems that you might not see on your pre-purchase inspection.

One last topic of importance that could possibly save a buyer or seller a lot of money again relates to the FMS and Glass cockpit installed in the aircraft. In most cases an aircraft that has been retrofitted with a Glass cockpit will add value to the tune of a few hundred thousand dollars; the lack of an upgrade for the FMS could reduce the value by the same amount.

An example can be found in the Beechjet 400A for which Rockwell Collins has an upgrade solution on its outdated FMS system that all but about 20 of these aircraft operators have had installed. As we examine the "Bluebook" value for the Beechjet 400A you will see a note that advises prospective buyers to reduce the price of the aircraft $250,000 (USD) for those aircraft that have not performed the upgrade.

COST EFFECTIVE UPGRADES

In today's tough economic climate where owners have seen the value of their aircraft drop dramatically over the last few years, aggravated by the presence of more aircraft on the market for sale, the reluctance of a seller to perform any upgrades prior to a sale might be understandable.

A recent conversation with an owner revealed that he was frustrated that his aircraft has been listed for over a year. Even though he had quite a few inquires, they had not materialized into any reasonable offers. Research revealed that there were twenty other aircraft of the same model listed for sale. Asked what he thought made his aircraft more attractive to prospective buyers, he spoke about how well kept the aircraft was, and that in the last few years it had even had a new paint job, while the engines were covered under a warranty program - to be blunt, all usual stuff. A review of the other aircraft revealed the same normal features, almost like a 'cookie cutter configuration' with no eye catching attributes that would make any of these aircraft stand out.

A survey of his aircraft showed that it was outfitted with an ICG Iridium phone and two seventeen inch monitors which he had listed on his advert. We discussed a few upgrade options that, for a reasonable amount of money would mean all of a sudden, his aircraft could start to stand out from the crowd! He would now be able to offer a ICG Iridium phone with WI-FI enabled Blackberry email service and two High-Definition (HD) seventeen inch monitors with Blu-ray DVD player.

Many - very likely yourself included - are ▶

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skeptical at the term "reasonable" when paired with value for money. But when placed into perspective - in the case of this owner the monthly interest payments he made, and the value that the aircraft has lost over the last year while sitting on the market - his upgrade costs suddenly started to look very reasonable indeed.

FINDING OUT THE HARD WAY

This trite expression is one we try to avoid in any transaction we might be involved with, and hopefully by providing some anecdotal incidents along with a wrap-up to segments previously covered in this article you can avoid some common costly pitfalls.

The most common snare I have seen in my career hinges around not having the proper documentation for the aircraft you just purchased. Having just completed a thorough Pre-Purchase inspection, you feel confident that your Avionics suite is in good working condition, but sooner or later, you will have some avionics squawks that need attending to. Once you have briefed the avionics technician about your issues, they are most certainly going to ask for the avionics wiring diagrams and equipment list.

It's alarming how many times I have witnessed an occurrence where neither is available, and excessive labor costs will surely result. These documents provide the technician with how the system is interfaced, where the components are located, how power is applied, and plenty more.

Recently an operator brought an aircraft in complaining that the entertainment system would not switch on. That operator didn't have any prints, and claimed the system had worked perfectly since they bought the aircraft. It was quickly determined that the system wasn't getting power even though the circuit breaker was seated properly.

Going on experience, the technician assessed that a relay was probably used to switch power to the system, and without prints one technician had to cycle the power switch while another 'listened' for the relay to chatter. Once this task was proved futile, the owner tried contacting the original owner. The technician rummaged through the log books, files and compartments on the aircraft to possibly find which facility installed the system in an attempt to acquire the needed documents.

None of these efforts proved fruitful, and the final solution was to physically follow the wire from the switch in the cockpit, through the radio rack and ultimately to the relay. Try following a wire from your circuit breaker panel in your garage to the light switch in your bedroom, and you'll get the idea of how complicated this task ended up being!

On another occasion, a Gulfstream pilot complained that the over-speed warning system was not operating properly as the over-speed warning alarm was sounding too soon. The aircraft had just come out of a pre-purchase inspection, and the problem was experienced on the initial flight back to the home base.

Integrity tests of both Pitot pressure systems found both to be compromised, resulting in the over-speed alarm actually going off too late. Since this pilot had the practice of descending at maximum speed, he was possibly exceeding the safe operating speeds for this aircraft. It was obvious that the altimetry systems were not checked during the inspection, and the operator was left to wonder what else could be at fault. The aircraft was grounded for two days as more extensive tests were performed, with the costs absorbed by the operator.

Lack of proper documentation will again prove costly if you plan to upgrade your avionics, as all Part 25 repair stations require accurate wiring diagrams, equipment lists, load analysis and weight and balance data. If the operator cannot produce this, the facility performing the upgrade will bill you for time and materials to produce these documents and/or pay fees to the OEM to produce them. Either way, it will add costs and even more importantly, add significantly to the downtime.

Let us close with one more cliché; "*You can pay me now, or you can pay me later*".

I urge all prospective buyers to pay the costs up front to perform proper due diligence when selecting an aircraft, or equipping an aircraft for re-sale. Make sure you spend extra in the short-term to secure top-draw consulting, research and/or testing. The costs you absorb during the pre-purchase inspection will be money well spent in the long-term.


BRIAN WILSON

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