



# What You Should Know About Avionics Appraisals:

## Understanding the True Value of a Retrofit or Upgrade on a Jet

Jeremy Cox draws on his experiences as an aircraft auditor to highlight how the devil is most definitely in the detail when it comes to appraising avionics systems...

**T**he Equipment List located in the Aircraft Flight Manual (AFM) often is incorrect because it has not been updated to reflect removed and/or retrofitted equipment and system components.

Such has been my experience when called upon to audit aircraft for appraisal or resale.

It is probable that avionics systems and component changes documented on FAA Form 337s are also found in the AFM to support the Supplements at the back of the manual. Sometimes component changes can be found in superseded

Weight and Balance Reports in the same AFM.

My 'go-to' and most important source of avionics equipment 'make and model' data, however, is the airframe log books. The only reliable way to find everything is to sort 'page-by-page' through every log, carefully jotting down when installed equipment is listed in an entry.

It is important to work from Back-to-Front (i.e. start by reading the 'Latest-and-Greatest' entries and work back from there). If you perform your audit from Front-to-Back you will be constantly scratching through noted equipment that was



subsequently replaced by a newer system or component.

I am a great advocate for Computerized Aircraft Maintenance Programs (CAMP) used to track the status of an aircraft. However, as with anything that requires human data input, the adage "garbage in; garbage out" is key. Therefore, I avoid collating my equipment data from any tracking program reports that are provided to me.

### A History of Mandated Upgrades

The avionics system changes and upgrades viewed through the log books usually read as though I was reading a regulatory mandate calendar. It's usual to see a mid-1980s to mid-1990s aircraft have a Traffic Collision Avoidance System (TCAS) installed as an aftermarket item.

As TCAS progressed into today's Airborne Collision Avoidance System (ACAS-II), I see these same TCAS systems getting upgraded to meet the hybrid surveillance requirements that will become law on 1/1/2020 through ADS-B Out.

Next came Satellite Communications Systems as

well as Ground-based Airborne Telephone Communications Systems. It also became possible to receive broadcast television while in-flight. Many of the Satellite-driven systems had immense price-tags for those that wanted to enjoy this new technology at the time.

With the new millennium came the requirement for Terrain Awareness Warning Systems (TAWS), which were mandated for 3/29/2001 and required existing systems to be interfaced with a GPS system to ensure position accuracy.

All transatlantic-capable aircraft as well as Europe-based aircraft then had to have their Communications Transceivers upgraded to extended frequency ranges, commonly known as '8.33 kHz spacing'. Onboard VHF Navigation Receivers also had to receive an internal modification making them immune to non-aviation FM broadcast signals; a modification commonly known as 'FM Immunity'.

As the skies of the world became crammed with more aircraft and the safety risk of keeping the aircraft that travelled the most crowded routes separated, next came the need for increased accuracy of on-board Air Data Systems and Altimeters to comply with the performance requirements of Reduced Vertical Separation Minima (RVSM), which was introduced system-wide in the US on 1/20/2005.

Today, the hot avionics change items include Electronic Flight Instrumentation Systems (EFIS), Cathode Ray Tube (CRT) replacements with Liquid Crystal Displays (LCDs), Future Air Navigation System (FANS), ADS-B and In-Flight Internet Connectivity, via a Wi-Fi Router.

### Specific Airplane Avionics Appraisal

Above, we touched upon the fact that often a significant modification or upgrade to avionics equipment is poorly annotated in the aircraft records, and the system status can only be confirmed by either a model number or part number.

If you miss any of these variables during your audit, the resulting 'error in value' will amount to tens-, if not hundreds-of-thousands of dollars.

As an aircraft broker, I always advise clients that they will recover 50-80% of the cost of an avionics upgrade if the outlay makes the aircraft more attractive to buyers and improves its market position, with the intent of making theirs the next aircraft to sell.

Yet, as an appraiser, I must make the following statements regarding avionics upgrades:



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- Avionics systems and individual equipment pieces (especially if they are highly desired and/or considered to be necessary, like Controller Pilot Data Link Communications (CPDLC), ADS-B, High-Speed Internet driven Wi-Fi, etc.) could add 100% of their total cost to the appraised value of the aircraft. It is important to understand that, in the case of compliance equipment, this value increase shall be driven down to 'zero' as soon as the mandated deadline has been passed;
- Avionics are no different than any other piece of equipment. They will be depreciated over time, both by accountants and by the values determined naturally by the resale market - driven by demand and availability;
- Aircraft Bluebook provides an avionics value depreciation chart listing the percentage of new values corresponding to equipment age (from 60% of new list price after one year, down to 30% after five);
- Avionics values quoted by the price/value guides, unless specified, always provide the 'new - retail, uninstalled' price for each system or component;
- New aircraft order/options price lists provide the best insight leading to more accurate base values that can be used in an appraisal;
- Aftermarket installation quotations are

important in establishing base values, but there are always installation compatibility issues specific to each aircraft that are extremely hard to translate against another aircraft being appraised. The whole point of an appraisal is to provide both an accurate and credible value for the authorized recipient of the report;

- The appraisal process that does not evaluate and assign individual values to systems and components is not reliably accurate; there are very few 'standard equipment' aircraft in existence;
- If an aircraft is parted-out and sold piece-by-piece, the prices realized on 'serviceable-as-removed' avionics gear will literally be 'pennies on the dollar', worse than any numbers quoted by a depreciation chart, unless there is a strong demand due to a lack of availability in the marketplace.

The bottom-line 'gotcha' with avionics appraisal, therefore, is that all provided documentation must be minutely examined to guarantee that the actual equipment installed is what is appraised and valued.

Appraising an outdated system that was removed years previously is indeed an example of unprofessional, shoddy appraisal work that is (in my opinion) unforgivable. ■

Jeremy Cox is experienced in presenting his expertise at aviation meetings, seminars and conferences. If you have an upcoming event and would like to discuss having Jeremy present, you can contact him via [jcox@jetbrokers.com](mailto:jcox@jetbrokers.com)