



# Value In Avionics:

Weighing the costs  
and benefits of an  
avionics upgrade.  
**by Ken Elliott**

**F**orever the frugal partner, my wife for years diligently selected the lower cost shoe, then complained of foot pain and sought the advice of medical experts. She will willingly admit to ignoring my suggestion that the quality (and subsequently price) of the shoe is directly related to the comfort of the foot. One day after all other avenues were exhausted she relented and purchased an expensive pair of shoes and has never looked back on the need to evaluate value when making choices.

Older and wiser today we both make decisions based mostly on a value equation. Another great example of that is choice of vacations, particularly accommodation. For some folks the vacation is about sightseeing, and not where they stay. After experiencing

several accommodation mishaps, for us it became very important to consider the hotel. However that choice is subject to a value equation where price is only one of several key factors.

When it comes to aircraft, and specifically avionics, it is highly likely that the value equations used in non-aviation related decisions can still be applied. For this article I will focus on the case for cockpit upgrades that can extend from Electronic Flight Bags (EFBs) to a full new avionics suite.

To begin with, the high level value equation could look something like **Figure 1** (overleaf) where the outcome could end up in any of the four quadrants, all of which are weighted according to the needs and priorities of various aircraft operators. ►

FIGURE 1. THE HIGH LEVEL VALUE EQUATION

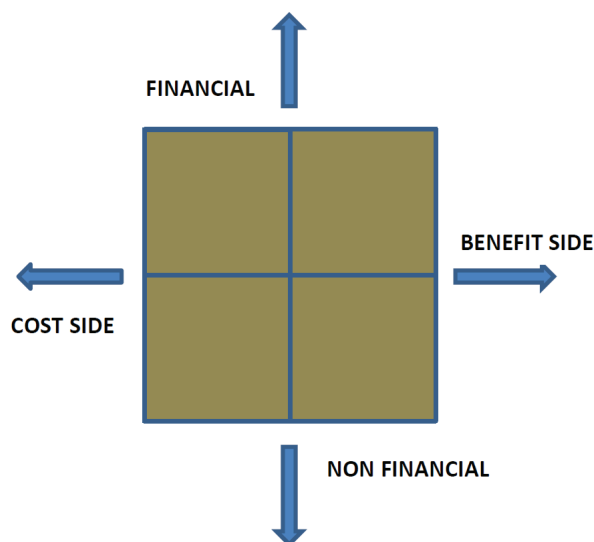


TABLE A – BUILDING A VALUE CASE

Consideration	Value Case
Bundling	Completing several upgrades at once reduces cost and downtime
Aircraft Maintenance Events	Combining cockpit upgrades with major maintenance makes sense
Are you keeping the aircraft?	Do you update to sell or to use long-term?
Currency	Is the upgrade likely to be outdated soon – obsolescence factor!
Multiple fleet	If you have several aircraft upgraded – pilots have familiarity
Selling	Selling an aircraft equipped against one non-equipped is a plus
Modifying existing systems	How many other existing aircraft systems need upgrades to work?
Impact to insurance	Consult your insurance provider for possible coverage savings
Is ground infrastructure required?	Sequestration is slowing NextGen. Only equip if airports are ready
Look at all the features	Sometimes minor features can be your largest gain!
On condition or recurring costs	Does the upgrade require significant recurring servicing?
Training needs	What are the training implications to your flight and service team?



On a recent trip to Capri, my wife and I elected to stay in an upper-price-range hotel that – as it turned out – included the #1 restaurant on this world famous island. It was not the most expensive hotel or restaurant, but our value experience was first rate. Value can mean many things to many people.

### TYPICAL COCKPIT UPGRADES

I recently discussed the topic of EFBs with a client and the immediate request was, “May I install iPads as Class 1 devices?” To begin with, EFBs – and specifically iPads – are a popular low-cost cockpit upgrade. There is also a trend toward the use of tablet interface devices that allow existing aircraft avionics to be integrated and shown on the actual flight bag. An extension of this trend is the ability to monitor and download aircraft performance at minimal cost.

At the other end of the spectrum would be a full glass cockpit. Usually the glass cockpit upgrade brings in other features such as weather, maps and enhanced vision displayed on primary or multi-function monitors.

Because most avionics require some form of pilot interface, just about any aircraft electronics upgrade outside of cabin entertainment involves something new in the cockpit. As a result there are many cockpit changes that fall in the range of complexity between the EFB and the full glass panel, including FMS, ADS-B, TCAS, TAWS, HUD-EVS, Electronic standby displays, Satcom, data com, and more.

### REQUIRED vs DESIRED

Currently assuming the business jet you own or are looking at acquiring is up-to-date for the U.S., you primarily only need to be concerned about ADS-B Out in 2020 as a requirement. Internationally there are ADS-B, PBN and data com (EU-2015) mandates either in place or on the horizon. Note other non-

cockpit requirements around CVR, FDR and ELTs may already be in place.

WAAS-LPV, weather, electronic charts, RNP, electronic instruments including engine and performance are some desired, but not required popular upgrades. Generally the higher the turn-key price, the harder the business case – and hence the lower the popularity. Full cockpit upgrades take a lot of business case development in order to move from an interest to actually closing a deal.

### DEVELOPING THE BUSINESS CASE

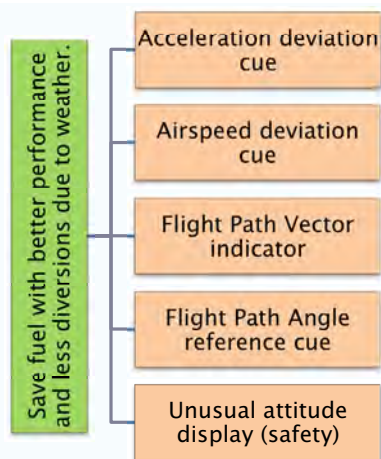
When it comes to value in avionics there are certain forces ‘against’. One of these is what the CEO and corporate executives ‘see’ or ‘use’. Sitting in the cabin there are not a lot of cockpit benefits that filter through...or are there?

There is the financial benefit of less time, fuel and ‘wear and tear’ some avionics upgrades bring. These may be quantified and provided as a return on investment (ROI) over a given time period. There is also the aspect of safety and situational awareness that many upgrades provide, but that are difficult to quantify. However improving efficiency and reducing pilot workload and stress all relate to added safety and awareness.

During a recent business case development for HUD and EVS, I was able to identify several key elements that clearly apply to many other cockpit upgrades (see Table A above). The list contained in the table is further expanded by actual data or features that support (see Figure 2, above right).

Using the given example in Table A, it is

FIGURE 2. COST SAVINGS UNIQUE TO HUD



clear there are many value components but there are barriers such as cost of the system; resistance to unfamiliar technology; existing head-up displays were clunky, hot and noisy over the pilot's head, and EVS performance is still gaining acceptance. One concern regarding value is the perception that exists in the very small world of aviation. Perception can boost or reduce an ability to sell and upgrade cockpits. Residual perception, if negative can really be a problem to overcome - even if the current version of an upgrade differs widely from earlier versions.

## OPERATOR VALUE CONSIDERATIONS

Value considerations truly begin at what you have to spend - and that may be what can be spent over a period of time. Some MROs develop multiple Supplemental Type Certificates (STCs) for a given cockpit system allowing the work to be completed in phases, launching aircraft back into service each time and spreading out the costs to the operator.

One operator asked me recently, "What does it cost; how long will it take to install; what does it do; and what is my ROI?" Structuring a value equation around that is a great place to start. So if there is struggle in fully and convincingly responding to those basics that will satisfy a flight department, it is time to bring in equally convincing business cases that will bring the sale case back toward the center of Figure 1.

**Note:** Vref and Blue Book are great tools for determining avionics' financial value related to overall aircraft equipage. Also note that Universal Avionics and Duncan Aviation

have a great WAAS-LPV ROI calculator on Duncan's website.

Clearly mandates 'sell' upgrades as with in the past ELTs, RVSM, TCAS, TAWS and soon with ADS-B Out - all, by the way, have some relevance to safety. Other factors can, however, be equally persuasive and at least elective from an operator's perspective.

The FAA and international authorities sometimes truly get it right and provide - what I call - 'enablers' that sit well with many operators. Perhaps the best avionics example for non-commercial aircraft in the US is WAAS-LPV, where ILS-like approaches can be flown with minimal ground infrastructure required. While they are a great business case for the FAA (less cost on the ground), they are an even greater gain for aircraft operators.

There are over 3,100 WAAS (LPV) approaches versus 1,524 Cat-I and II ILS. This provides additional lower precision landings for equipped aircraft. The FAA has further enabled this benefit or value by allowing 100 FT DH into all the LPV and ILS Cat-I approaches if straight-in, when an aircraft is equipped and certified with HUD and EVS (EFVS). But that is not all. The FAA now has a Notice of Proposed Rule Making (NPRM) that will allow suitably equipped aircraft to go all the way down to 0/0 in low-visibility.

Some would argue that a bigger 'operator-perceived' cockpit benefit is the EFB. EFBs provide significant benefit for the financial cost while tooling the pilot with all sorts of features, saving time and the weight of paper.

TABLE B - EXPANDING A VALUE CASE (HUD)

Business Case	Expand the Case
<b>Safety</b>	Eliminates the safety of flight issues for approach and landing
<b>Access</b>	Tripled the aircraft access into airports in most weather conditions
<b>Performance</b>	Increase of runway access and pilot performance with a HUD
<b>Situational Awareness</b>	24-hours of real-time visual clarity low visibility conditions
<b>Cost Savings</b>	Extend the service life of aircraft by book performance of any pilot
<b>ROI</b>	A positive return on investment and resale advantage
<b>Flexibility to Upgrade</b>	Multiple STCs that allow phased installations
<b>Extended Warranty</b>	Showing faith in the product quality and a commitment to clients
<b>Bonus Depreciation</b>	Possible capital equipment tax depreciation
<b>Premier Product</b>	The only EVS with 1000ft RVR credit; the latest HUD design
<b>Equipped for the Future</b>	FAA NPRM allowing even more operational benefits than today

There are a number of other value considerations over and above those previously mentioned that may be very meaningful for operators when considering cockpit upgrades - see **Table B** (above). I have only brushed the surface of value as it relates to avionics cockpit upgrades - but there are many more resources to help you, some of which include the Aircraft Electronics Association (AEA) [www.aea.net](http://www.aea.net) and National Business Aviation Association (NBAA) [www.nbaa.org](http://www.nbaa.org), which are great resources for Avionics value research. Meanwhile Flight Safety Foundation (FSF) [www.flightsafety.org](http://www.flightsafety.org) and EASA's Skybrary [www.skybrary.aero](http://www.skybrary.aero) are powerful tools for safety and awareness value cases.

➤ Ken Elliott is an avionics veteran of 40 years and more recently focused on NextGen. His work within the NextGen Advisory Council sub-committees brings him close to current and intended development effort.

Equally, his specialization in low-vision operations provides a deeper insight into one of the pillars of NextGen. Ken has served the aviation industry on three continents from light GA to large corporate aircraft. His current employer Jetcraft is a leading aircraft brokerage company with worldwide presence.

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