



Maximizing Avionics Upgrades in Older Business Jets



INDUSTRY REPORT

There are good reasons why the business and general aviation electronics aftermarket sector has experienced nine consecutive quarters of growth, according to the Aircraft Electronics Association's (AEA) first quarter 2019 report: mandates, obsolescence and a wealth of opportunities and options.

That's why, if you're an owner or operator of a Bombardier Global Express or Learjet 40/45, Embraer Legacy 600, Falcon 900EX/C, Citation X, Citation 550/560 or Dornier 328 with the Honeywell Primus 1000/2000 cockpit or a Gulfstream G-IV/V with an SPZ-8400/8500 cockpit, a combination of factors makes an avionics refresh ideal for your aircraft right now.

One major consideration for cockpit avionics upgrades in the aforementioned aircraft is the upgrade trade-ins and savings on new insurance plans that have been introduced by Honeywell for its Primus Elite avionics suite, which is the modern replacement option for aging cathode ray tube cockpit configurations.

These new options include the following:

- Synthetic Vision is now standard with Primus Elite
- \$35,000 trade-in credit for each individual CRT display
- Options to replace one LCD for CRT display at a time upon failure
- Free year of Maintenance Service Plan-Avionics

Adding Primus Elite to the Primus 1000/2000 configuration brings improved situational awareness, new electronic displays of Jeppesen charts and maps, XM graphical weather overlays and video inputs, all enabled and controlled through a cursor control device.

Joey Meier, chief pilot for NASCAR champion Brad Keselowski, said one of the noticeable differences he saw in upgrading his Lear 45 to Primus Elite last year was the amount of heat and weight that gets taken out of the cockpit and off the aircraft.

"On the standard CRTs of the Primus 1000 cockpit, when the avionics are powered up and turned on, it can generate a lot of heat in the cockpit because it's an old projector style screen. But now on the LCD, it's cool to the touch, you can leave them on indefinitely and there's little to no heat generated," said Meier.



MAXIMIZING AFTERMARKET VALUE AND HONEYWELL'S 2019 PRIMUS INCENTIVES

With the Honeywell Primus Elite upgrade, it is now possible for owners of aging Bombardier Global Express business jets to have the same technology featured in the new \$70 million Bombardier Global 7500 at a fraction of the cost. That's what a private owner of a Global Express experienced when he invested \$5 million in what Honeywell described as the "largest single aircraft update in the business jet space," back in November 2018.

"Right now, aircraft owners and operators of those older Globals and other legacy jets can decide about buying a new one for a really high price or getting their old one retrofitted and modified," said Nils Janssen, managing director of ACC COLUMBIA Jet Service. "We upgraded a 15-year old Bombardier Global Express for \$5 million, which is less than 10

percent of the money that the owner would have spent on a new Global jet."

"It could cost between \$65 to 70 million for a brand new business jet like the Global 7500," said Janssen.

The Global Express upgrade included:

- Geo-referenced airport charts
- Graphical depiction of aircraft position during approach
- Enhanced Map on MFD with dropdown menus via a Cursor Control Device (CCD)
- Synthetic Vision
- XM Weather (option)



The Old: The original CRT-based Learjet 45 cockpit.



The New: Learjet 45 with Primus Elite



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Honeywell's new basic Primus Elite upgrade package includes a free year of MSP Avionics protection from Honeywell, which is an approximate savings of \$45,000 for the first year. Under the plan, any piece of Honeywell avionics that fails gets automatically replaced for free. There is also a new monetary value of up to \$35,000 applied to the purchase of CRT displays provided by Honeywell for trade-ins of old CRT assemblies.

Airspace mandates take effect in 2020 in European and U.S. airspace, and having an upgraded cockpit such as Primus Elite that includes ADS-B compliant transponders, GPS position sourcing and wiring eliminates the challenge of complying with ADS-B and other upcoming mandates.

Over time, Honeywell has elevated its Primus Epic avionics embedded architecture, continually reducing weight and making it more software intensive. Among these upgrades include the use of processor cards installed in a cabinet rather than individual components for aircraft functions, such as the flight management system, central maintenance system and ACARS messaging.

Navigation-wise, the pilots of the Express upgraded by ACC Jet will also find satellite-based augmentation system-capable GPS, as well as the ability to fly LPV and RNP AR routes. They're also able to customize the Microsoft Windows-like interface of each individual cockpit display, including, for example, adding a small infrared camera view of the nose camera to the upper right-hand corner of the captain's left multi-function display view.

“ the Global Express operator can customize the way pilots use connected tablets and/or displays.



Since the ACC Jet upgrade also included the installation of Honeywell's JetWave modems for satellite-based internet connectivity, the Global Express operator can customize the way pilots use connected tablets and/or displays.

Another business jet with a lot of currently registered aircraft when considering aging CRT-based cockpits is Embraer's Legacy 600. Uniquely, the Brazilian manufacturer introduced a refreshed Primus avionics cockpit for the Legacy 650 model as a standard line-fit production configuration at a time when virtually no one could afford jets or aftermarket upgrades. This upgrade is now available to the in-service Legacy 600 as well.

That timing has left a lot of Legacy jets in-service with aging, obsolete avionics, according to Jose Costas, who spent 18 years as the vice president of sales for Embraer's European division prior to joining Duncan Aviation as their sales president for the same region in March 2019.

“The Primus Elite improvement for used aircraft didn't initially see much demand as a result of the high depreciation in aircraft prices in general as a result of the global financial crisis in 2008 and high cost of investment in the new avionics upgrade,” said Costas. “Notice that all new Legacy 650s delivered after 2009 had the new Primus Elite avionics from the factory.”

“With the pre-owned market becoming more stable, the fleet for sale on the Legacy 600 right now, for instance, is less than 7%, which is one of the lowest inventory, the aircraft prices are stabilizing. The Legacy 600 is a workhorse designed to endure air-line utilization profile and low operating cost. To upgrade its avionics shall be the normal path for most Legacy 600 owners.”

CRTs vs LCDs

Honeywell no longer supports aftermarket repairs for cathode ray tubes, which leaves options scarce if finding replacement parts for existing CRTs. That has led to the introduction of the one-for-one CRT for LCD display swap.

On average, the weight savings per cathode ray display replaced by a liquid crystal display is 7.5 pounds. LCDs also enjoy an average of 4,000 hours mean time before failure compared to 2,000 for CRTs, according to StandardAero.

There is also a growth connector to add new applications to the displays that is included along with the standard CRT for LCD swap.



Figure 1: On the back of the DU-870/875 is a growth connector for new applications.



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On the Falcon 900, the Primus Elite upgrade includes a replacement of five CRT displays with five LCDs.

The Falcon 900 C and EX models, which entered into service in 1996 and 2000, each feature cockpit designs with five displays in the standard configuration. That means if all five displays are replaced, there is an automatic weight savings generated of 35 pounds.

Each LCD is installed with a new tray and an additional connector that can adapt the display to accept new applications and information such as a connection to data distorted across an ethernet data bus, according to Jerry Sanders, director of business development at StandardAero.

Sanders describes the Primus Elite upgrade package for the Falcon C/EX flight deck as a \$700,000 investment for the full avionics suite upgrade. The upgrade does not require changes to existing CRT symbol generator software, the aircraft's existing primary flight display, multifunction display or EICAS symbology and format.

"Much like if you were to swap your CRT-based home television screen for an LCD television, you would not need to change the video game system, cable box or DVD player that generates imagery and video on those screens. We use that same premise when we remove a CRT screen and install an LCD, the existing symbol generators will generate the same symbology," said Sanders.

"On the Falcon 900 C/EX, there is no aftermarket solution other than Honeywell for those displays. The company has done what they can to keep those displays, but if an operator comes to us and says we want to keep those CRTs for the long-haul, the only thing we can recommend is that the reality is there's nothing we can do to help maintain them."

StandardAero also has a special incentive program that provides trade-in credits of \$35,000 per DU-870 display for in-service Falcon 900 aircraft. Across all five displays, that would equate to an immediate savings of \$175,000 toward the full \$700,000 cost required to add the full Primus Elite avionics pack-

age including the new LCD displays, upgraded flight management computer and new cursor control devices.

A new Falcon 900LX fresh out of the factory costs \$44 million. In comparison, if a 900 C/EX operator were to use the CRT trade-in program savings, they could get an aircraft with avionics capabilities that are nearly identical in functionality to the flight deck technology featured on a new 900LX for \$525,000 — or less than one percent of the cost of a new 900LX.

Out at Duncan Aviation's aircraft installation facility in Dallas, Texas, one of the aircraft models where they have been seeing great interest in avionics upgrades is the Embraer Legacy 600. Inside the cockpit of the Legacy 600, a total of up to nine CRT displays could be replaced, including old DU 870s (5), CD-810s (2) and RM-850s (2).

"Honeywell has pretty much quit supporting the CRTs," said Denis Kruse, a senior sales representative for Duncan Aviation. "Sooner or later you're going to have to deal with the obsolescence, especially if you try to re-sell it. Having the LCD displays and the avionics to meet the upcoming mandates already in there before 2020 is a better approach toward operating and maintaining that Legacy jet and establishing a better aftermarket value for its LCD-focused upgraded cockpit."



Primus Elite Synthetic Vision System is available for Gulfstream GIV, GIV-SP and GV aircraft.

Geo-referenced airport, arrival and departure charts available with optional Jeppesen subscription.

