Primus EPIC Pentium M and NGFMS Upgrade for the Embraer 190 Lineage 1000

For Embraer EMB-190 Lineage 1000 operators, Honeywell is pleased to inform our customers of the availability of several enhanced functionalities.

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Quick Reference Table

Effective Dates:	01-January-2020 through 31-December-2020
Revision - Notes:	Initial Release

1. Introduction

For Embraer EMB-190 Lineage 1000 operators, Honeywell is pleased to inform our customers of the availability of several enhanced functionalities. This bulletin discusses the availability and feature details for the following new functionalities:

- Pentium M Hardware Update
- Display Unit and MCDU Updates
- Next Generation Flight Management System (NGFMS)
- FANS2 – CPDLC
- Advanced RAAS (Smart Runway™/Smart Landing™)
- Synthetic Vision System (SmartView™)[1]
- Interactive Navigation (INAV™) on MFD[1]
- Electronic Charts and Maps[1]
  Note 1: Optional Feature which requires upcoming Avionics Software Load 27.3

These functionalities for the Embraer Lineage 1000 are included either in the baseline software load or as an Optional upgrade in EPIC Loads 27.X.

The NGFMS for Lineage 1000 aircraft builds on the continuous product improvements seen through the systems integration on the larger B747-8 and 747-400 (retrofit) platforms, delivering improved fuel efficiency, reduced direct operating costs, reduced pilot workload and improved safety.

The Synthetic Vision System (SmartView™), Interactive Navigation (INAV™) on the Multi-Function Display (MFD) and Electronic Charts and Maps have been certified and deployed in the smaller business jet market for several years. These three features are considered the Displays Advanced features package and will be an optional item for the upcoming Avionics Load 27.3 on the Lineage 1000 fleet.

The next section will describe the value and benefits of upgrading both the hardware and the EPIC software on your Embraer Lineage 1000 aircraft. Table 1-1 shows each major software feature along with the required hardware.

OIB 2020-45 Primus Epic Embraer Lineage 1000 Pentium M and NGFMS

Software Feature	Hardware				
	Pentium M	Display Unit 1080-3	MCDU-R	Mode 2 VDR	SBAS GPS
NG FMS (requires Load 27.X)	✓				
LPV (requires Load 27.X)	✓				✓
FANS2 requires (Load 27.X)	✓			✓	
PM-CPDLC (requires Load 25.X)	✓			✓	
Advanced RAAS (requires Load 27.X)	✓				
SVS/INAV (requires upcoming Load 27.3)	✓	✓	✓		
Charts (requires upcoming Load 27.3)	✓	✓	✓		

Table 1-1 Hardware Requirements for Software functions

<div align="center">***U.S. TAX INCENTIVE***</div>

In 2018 the U.S. Government approved a tax code change, as part of the Tax Cut and Jobs Act of 2017, allowing U.S. based Aircraft Owners that use their aircraft for business purposes to take a Tax Write-off equal to 100% of the upgrade cost in the first year, with a few exceptions. Please check with your Tax advisor for details.

2. Value and Benefits

2.1 Hardware

2.1.1 Pentium M – Modular Avionics Unit Upgrades

There are substantial Future Growth options available in the Pentium M configuration. Improvements include increased processing power to support next-gen and value-added functionality. In addition to NG FMS, Pentium M upgrade is a pre-requisite for SmartLanding (latest EGPWS based Situational Awareness) LaserRef VI with High Step 2, FANS-2 (PM-CPDLC and FANS-1/A (CPDLC/ADS-C integrated with FMS)). Follow-on (upcoming Load 27.3) Advanced Features (Options): SVS, INAV and Electronic Charts.

The Pentium M upgrade consists of:

- Replace existing 4 Actuator Input-Output Processor (AIOP) Modules
- Replace existing 6 Network Interface Controller/Processor (NIC/PROC) Modules
- Replace existing CMC Module
- Remove existing Database module and replace with Air Management Module (AMM)

Table 2-1 describes the old and new part numbers for the Pentium M upgrade. Operators should contact Embraer (contact.center@embraer.com) for Service Bulletin, SB190LIN-31-0015 (Software Load 27.1) or SB190LIN-31-0016 (Software Load 25.7).

Pentium II to Pentium M upgrade details				
Old Part Number(s)	New Part Number	Part Descr.	Transaction Type	Qty
7028432-1901	7028432-1902	AIOP	New Part	4
7026542-1901	7038231-1902	NIC/PROC	New Part	6
7026548-1901 or -1902	7034055-1901	CMC	New Part	1
N/A	7027208-1903	AMM	New Part	1
7026532-1901 or -1902 or -1903	None	Database Module	Removal	0

Table 2-1 Pentium II to Pentium M

By upgrading with these advanced options, operators of the Embraer EMB-190 Lineage 1000 Jets will be able to take advantage of precision navigation capabilities, benefit from improved fuel efficiency and performance, improve the situational, terrain/obstacle and weather awareness. For example, the operator with NGFMS can look forward to up to 2% reductions in fuel burn per cycle through ECON speeds and off-idle descent, and further reductions through reduced track miles flown and fewer missed approaches LPV approach capabilities are enabled. The available upgrade consists of several options which are outlined below.

2.1.2   Display Unit and MCDU

Depending on the desired functionality, Display Units and MCDUs may need to be upgraded prior to installing the software. The latest DU-1080 display unit and MCDU are based upon current LCD display technology and are intermixable and interchangeable LRU's on your aircraft. The original EJET display units and MCDU's are now approaching 20 years old and Honeywell has redesigned these units on multiple occasions and can no longer repair many of these older display units and MCDU's due to obsolete components. Honeywell will not be able to guarantee repair of the original configuration of Display Units after the end of 2018 (for those customers not currently in a contracted maintenance program for the EJET Displays and MCDUs). Please see referenced Service Information Letters in Appendix 1 for additional detail. The latest replacement products are being offered at a discounted unit exchange price and will come with a new 3 year warranty. Units can be exchanged either on a proactive basis, or on an attrition basis based on operator needs and requirements. Installation is based on Embraer type certification and the operator can request the more current part numbers added to their aircrafts' Illustrated Parts Catalog (IPC), if not already added.

Benefits
- The latest replacement products are being offered at a discounted unit exchange price
- New 3 year warranty
- Advanced display features compatibility (i.e. electronic charts and maps, synthetic vision). See Section 2.2.4.1

As noted, older versions of DU-1080 Display Units and MCDU's can be used in an intermixable configuration with these new part numbers on your aircraft.

Table 2-3 describes the old and new part numbers for the Display Unit and MCDU upgrade. A full shipset of Display Unit and MCDU upgrades are required for the Displays Advanced Features as noted in Table 1-1.

Display Unit and MCDU Upgrade for Displays Advanced Features				
Old Part Number(s)	New Part Number	Part Descr.	Transaction Type	Qty
7023460-803 or 7037620-813	7036340-803	DU-1080-3	New Part	5
7025725-930 or 7033700-930	A50A000-00-150	MCDU	New Part	2

Table 2-2 Display Unit and Multipurpose Control and Display Unit Upgrades

2.1.3 Mode 2 VDR and SBAS GPS

If enabling either PM-CPDLC (Load 25.X) or FANS 2 (Load 27.X) on the aircraft is desired, a Mode 2 enabled 3rd VHF Data Radio (VDR) is required. Table 2-4 describes the old and new part numbers for the VHF Data Radio. If a third VDR is already installed, the unit can be sent into the Honeywell Service Center to be upgraded to a Mode 2 compatible unit, otherwise, a new unit can be purchased.

VHF Data Radio				
Pre Mod PN (s)	Post Mod PN	Part Descr.	Transaction Type	Qty
7026201-804 or -801	7026201-803	VHF Data Radio	Modification to current unit	1
N/A	7026201-803	VHF Data Radio	New Part	1

Table 2-3 VHF Data Radio

If enabling Localizer Performance with Vertical guidance (LPV) approaches (Load 27.X only) is desired, a SBAS capable GPS module is required. Table 2-4 describes the old and new part numbers for the SBAS GPS. Operators have the choice to either upgrade their current GPS units or purchase new units.

SBAS GPS				
Pre Mod PN	Post Mod PN	Part Descr.	Transaction Type	Qty
245-604067-001	245-604067-100	GPS	Modification to current unit	2
245-604067-001	245-604067-100	GPS	New Part (Exchange)	2

Table 2-4 SBAS GPS Hardware

2.2   Software Upgrades

2.2.1   NG FMS

As mentioned in prior sections, the Pentium M upgrade is a prerequisite for the Load 27.X/NGFMS. Special pricing for the Pentium M upgrade has been established for operators that chose Load 27.X/NGFMS. The Load 27.X/NGFMS retrofit will be via an Embraer Service Bulletin and requests can be made at any time. Honeywell has generated various documentation to explain the differences between EPIC FMS and the new NGFMS. This documentation can be found on Honeywell's myAerospace.com Portal (Technical Publications) website. Refer to Appendix 1 for the reference numbers. In addition, Embraer has released training videos explaining the differences, features, etc. and can be found on the myTechCare website (https://mytechcare.embraer.com - requires an account).

2.2.1.1   Benefits of the Basic NGFMS Upgrade

- Multiple secondary flight plans with route copy and swap; full performance predictions on Secondary
- Full DO178B Level B FMS
- Support for all ARINC 424 flight plan leg types
- Table-driven performance model utilizing detailed OEM provided Aero/Engine Models and an improved atmospheric model to provide precise performance predictions for
    - Path transitions for next two waypoints: fly what you see
    - Closest airports: display of 10 closest airports with fuel predictions
- Improvements to the AOC datalink function to include Performance Data Uplink and Reports Downlink functions
- Robust roadmap for the future

2.2.1.2   Additional Benefits of Gold Package Option

- Optimized idle descent path provides fuel savings through early ToD/reduction from cruise thrust and better speed management avoiding usage of speed brakes and additional thrust
- Cost Index and ECON speeds enables compliance with cost reduction strategies, optimizes trades off between fuel burn and the time-related direct operating cost

2.2.1.3   Additional Benefits of Advanced Navigation Option

NG FMS provides the option of reduced go-around and diversion through use of new landing systems (RNAV (RNP) and LPV)

2.2.1.3.1 Localizer Performance with Vertical Guidance (LPV)

- LPV Approach increases the approach options to airports and runway ends both with and without ILS with low minima and highly precise, stable lateral and vertical guidance
- Access to lower LPV/APV minima in North America and Europe

2.2.2 PM-CPDLC and FANS2

2.2.2.1   PM-CPDLC – Load 25.4 and later

Protected Mode - CPDLC is a higher speed data link service using PM-CPDLC under the ATN protocol. (Also known as Link 2000+ and FANS B)
In a Pentium M Hardware configuration, the Embraer Lineage 1000 can be upgraded to use PM-CPDLC in Load 25.4 and later.

2.2.2.2   FANS 2 – Load 27.1
The integrated FANS 2 implementation in NG FMS combines two different CPDLC technologies, FANS 1/A+ and ATN-CPDLC.

FANS 1/A+	ATN-CPDLC
Oceanic and remote airspaces US continental clearance delivery	**Continental airspace**
Transmission ACARS (VDL Mode A and 2), ADS-C	Transmission ATN Network and VDL Mode 2

- FANS 1/A+ and ATN-CPDLC integrated in one solution
  - Enables a seamless transition from oceanic to continental operations

- Load 27.1, FANS 2 data link system became part of NG FMS
  - Enables validation and direct loading of objects received via data link (route clearance, offset, direct-to-clearances and holds) in the FMS.

2.2.3   Advanced RAAS (Smart Runway™/Smart Landing™)
Honeywell's SmartRunway addresses one of the National Transportation Safety Board's (NTSB) top 10 global safety concerns — runway incursions. SmartRunway is the next generation of Honeywell's Runway Awareness and Advisory System (RAAS) which is a proven runway safety system.
SmartRunway includes new advisories and visual messaging and complements electronic flight bag (EFB) solutions, if installed, through 'heads-up' advisories and supports 'quiet' cockpits with graphical alerts. SmartRunway is a proven global solution for reducing runway incursions.

Another key safety issue and NTSB concern is the appropriate energy level for landing, required landing distance, and adequate safety margin when landing; all key areas that are addressed with Honeywell's SmartLanding package.
Runway excursions are typically caused when an aircraft has a hard or long landing from approaching the runway too high or too fast*, common components of an unstable approach, or when the aircraft is not properly configured for landing. There are approximately 30 global runway excursions each year, primarily caused by lack of situational awareness and human error.
Runway excursions represent 96% of the total runway related accidents, and 80% of those runway excursions have resulted in fatalities.
Honeywell's new SmartLanding improves flight safety and helps reduce the risk of a runway excursion by alerting crew members if the aircraft is going too fast, too high or going to incur a long landing. SmartLanding encourages compliance with stabilized approach criteria, such as:
- Aircraft should be stable at 1000 feet above the field

- Aircraft MUST be stable at 500 feet above the field
- Aircraft is properly configured to land
- Aircraft is on the correct vertical path
- Aircraft is at the correct speed

Key Benefits
- Decreases the risk of runway incursions and excursions
- Increases runway situational awareness and the likehood of stabilized approaches
- Supports 'heads-up' operations with aural advisories
- Supports 'quiet' cockpits with visual advisories
- Configurable to fit operating environment requirements
- Inhibit switches are optional
- Positioned for future growth and ADS-B implementation

2.2.4   Upcoming Optional Features in Avionics Load 27.3
  2.2.4.1 Advanced Display Features

2.2.4.1.1 Synthetic Vision System (SmartView^{TM})
SmartView is a Synthetic Vision display built on the reliable foundation of Honeywell's terrain and navigation databases. SmartView provides pilots with an ambient, natural and continuous view of their flight path, terrain and navigational environment, without changing the way the Primary Flight Display is used. SmartView is a valuable tool that can help pilots make necessary short term decisions during flight. It complements Honeywell's Interactive Navigation (INAV) system display

that provides a strategic tool to enable on-screen graphical flight planning to allow the pilot to plan far in advance of events in the flight plan.

Seamless integration of terrain, runways and obstacles makes Honeywell's SmartView the most advanced Synthetic Vision product in business aviation. SmartView was developed through a rigorous human-centered design process, including extensive collaboration between Honeywell engineers and pilots of several platforms.
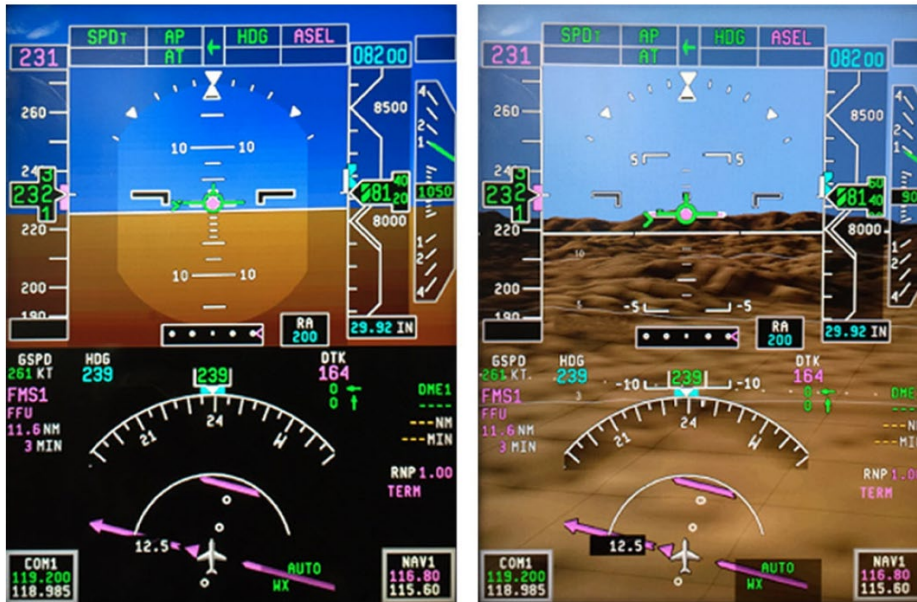

Figure 3-1 Embraer PFD with and without Synthetic Vision

2.2.4.1.2 Interactive Navigation (INAV™) on Multifunction Display

Honeywell's Interactive Navigation (INAV) provides increased Pilot situational awareness with the terrain display on the Lateral and Vertical Windows on the Multifunction Display. INAV uses the same reliable terrain and navigation databases used by the SVS and NGFMS Systems and provides many additional features from the earlier Map product:

- Geo political data (Boundaries, Lakes) and Grid lines
- Obstacles
- VOR Course Line
- Nearest Airports
- Altitude Pre Selector Arc and View Frustrum Lines
- Designator Feature
- Show Info on various Navigation layers
- Radio Tuning
- Search Function

Figure 3-2 Interactive Navigation Display

2.2.4.1.3 Electronic Charts and Maps

The Electronic Charts and Maps brings airport, Standard Instrument Departure (SID), Standard Terminal Arrival Route (STAR), Approach, Noise, NOTAM and Airspace charts to the pilots through the Multifunction Display. The fully integrated Charts solution also provides:

- Aircraft Symbol depiction on chart (requires a geo-referenced chart)
- Search and Print capabilities (Printer installation required)
- Zoom, scroll and rotate for optimal viewing
- Interfacing with NGFMS to automatically populate Flight plan airports (ORIG, DEST, ALTN)
- Night Mode viewing

Figure 3-3 Electronic Charts and Maps with and without Night Mode

3.   Honeywell Maintenance Service Plan (MSP Avionics)

Honeywell Maintenance Service Plan (MSP Avionics) is a maintenance service plan that offers coverage for your Honeywell Avionics. Choose the plan that best meets your needs. Specially priced plans are also available for fleet operators. Take the uncertainty out of repair and maintenance costs. A fixed-price MSP contract guarantees that your repair bills will not exceed your budget. For more information about MSP, please contact Honeywell at MSPAvionicsSales@Honeywell.com.

4.   Contact Information

Find your nearest Sales contact by visiting our [Direct Access Directory for Business Aviation](#). Click on **Area Sales Managers** and use your current location or the Manual Search option.

You may also download our **Honeywell Direct Access app**:

The Direct Access mobile app launched last year provides business aviation customers quick access to Honeywell Aerospace's technical, business, parts and sales support; the closest dealers and service centers, the Aircraft on Ground (AOG) desk and other valuable resources.

The Direct Access app is free and can be downloaded at the [Apple iTunes](#) and [Google Play](#) stores.

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Customer Support
USA – 1-800-601-3099
International – 1-602-365-3099

Honeywell reserves the right to rescind or revise this information bulletin at any time, or through future information bulletins.

Appendix 1
SIL References

Honeywell Service Information Letter	Date Released	Subject
D201502000021 Rev 3	24-October 2019	Multipurpose Control and Display Unit (MCDU), PN 7033700-930, -940, -945, -951 - Part Obsolescence
D201604000016 Rev 1	06-March 2017	Obsolescence Notification for Multipurpose Control Display Units (MCDU), Base PN 7025725
D200902000025 Rev 0	06-March 2009	DU-1080 Display Unit (DU), PN 7023460-801 thru 804 and PN 7032400-802; Identify Hardware Obsolescence and Interchangeability
D201105000063 Rev 0	09-June 2011	Display Units (DU)s, DU-1080, PN 7023460-801, -803, and DU-1080-2, PN 7037620-813; Identify Hardware Obsolescence and Interchangeability
D201805000044 Rev 0	02-July 2018	PRIMUS EPIC Embraer 170/190 Series – Instructions on Ordering Part Numbers Called Out in Embraer Service Bulletins, Which Includes Various Types of Software and / or Hardware
D201007000016	27-April 2018	NG Flight Management System (FMS) for the Embraer 170/175/190/195/ Lineage 1000 Pilots Guide, Load 27 (27.1/27.2/27.3).
D201009000038	31-March 2016	Description of Crew Impact Changes for the Embraer 170/175/190/195/ and Lineage 1000 NG Phase 7, Load 27.1, Pilot Familiarization Guide.
D201505000051	31-May 2016	Primus Epic AV / NG FMS Operational Overview of the Embraer 170/175/190/195 and Lineage 1000 Pilot Familiarization Guide, Load 27.