

# FedEx HUD/EFVS Update

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# Overview

- Why HUD/EFVS
- Fleet Installation Status
- Operational Approval Process
- Flight Training
- Closing Thoughts

# Definitions

- What is an Enhanced Flight Vision System?
- Advisory Circular 90-106 defines EFVS as:
  - A display element (HUD in FedEx's case)
  - Sensor (FLIR in FedEx's case)
  - Computers and power supplies
  - Indications, and
  - Controls
- EFVS provides situation awareness, and 14 CFR § 91.175(l) operational credit

# Why HUD/EFVS?

- Primary Reason: Enhanced Safety
  - Increased situational awareness
  - Energy management
  - Aircraft control
  - Monitoring
  - Exposure to Global Network and 24/7 operations
- Secondary Reason: Improved Access
  - Lower minimums
  - Prevent service failures/disruptions
  - Enhance FedEx Brand: ABSOLUTELY, POSITIVELY...

# FEDEX HUD/EFVS FLEET STATUS

# HUD/EFVS Fleet Status

- MD-11: 64 installed
- MD-10: 60 installed, 15 more planned
- B-757: all planned (87 total)
- B-767: all planned (27 firm and 50 options)
- B-777: all planned (45 firm and 15 options)
- A300-600: to be determined (120 total)

Goal: Minimum of 329 HUD/EFVS Aircraft

# EFVS OPERATIONAL CREDIT APPROVAL PROCESS

# Goals

- OpSpec C048: 14 CFR 91.175 (l)(m)
- Approach Ban Removal
- EU OPS EVS Minima Credit
- Global use of EFVS for Credit



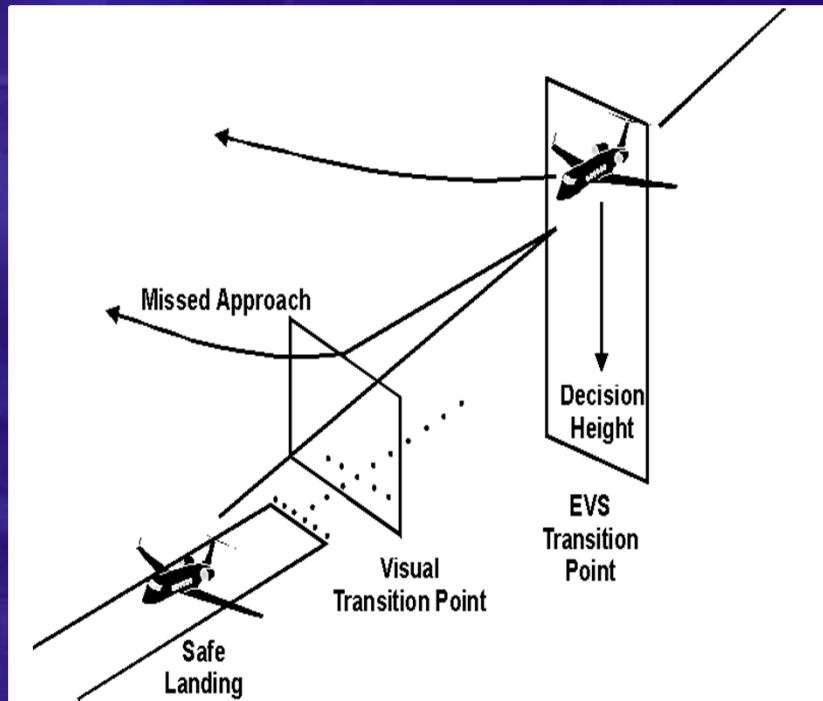
# Current FAA EFVS Operations

- 14 CFR Part 91.175 (l) (m)
- “The pilot determines that the enhanced flight visibility observed by use of a certified enhanced flight vision system is not less than the visibility prescribed in the standard instrument approach procedure being used...and may continue to 100’ above TDZE using enhanced flight visibility...”

# FedEx Exemption Part 121.651(b)(2), “Approach Ban”

- Straight-in CAT I may begin with reported weather of at least 1000 feet RVR or ¼ mile visibility
- Applies to approaches with vertical and lateral guidance, i.e., ILS, LNAV/VNAV, etc.
- Published inbound course must be within 10 degrees of the magnetic heading of the runway
- Defines specific pilot, training, and recording requirements

# EASA Enhanced Vision Rule



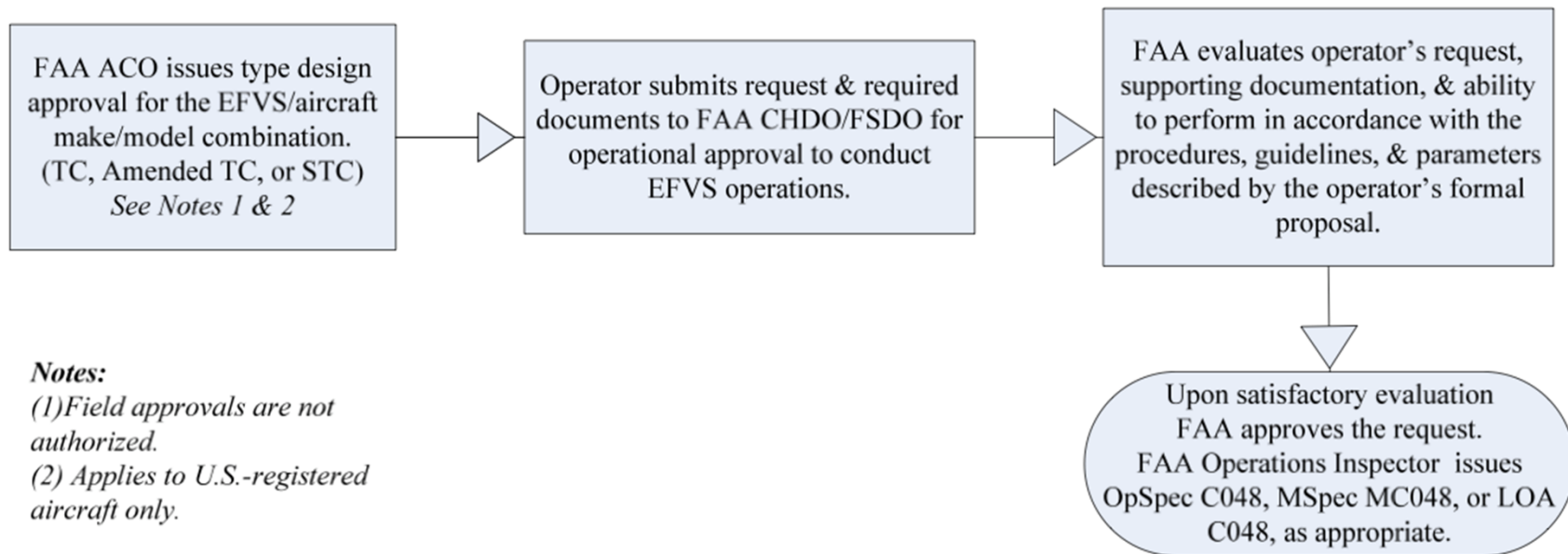
EU Rules provide for aircraft with EVS to Begin the Approach instead of Hold for Weather

EASA Approach Table (Appendix 1, OPS 1.340 Table 9-1) Benefits Utilising EVS

RVR/CMV normally required	RVR/CMV for approach with EVS
550	350
900	600
1500	1000
1700	1100
2500	1700
4000	2600
5000	3300

# FAA Approval Process Overview

**FIGURE 5. EFVS APPROVAL – PROCESS OVERVIEW FOR PERSONS INTENDING TO CONDUCT OPERATIONS UNDER PARTS 91K, 121, 125, AND 135.**



# Approval Process Phases (8900.1)

- Phase One: Pre-Application
- Phase Two: Formal Application
- Phase Three: Document Compliance
- Phase Four: Demonstration and Inspection
- Phase Five: Certification

# Application Elements (AC 90-106)

- Description of aircraft and equipment
- STC Airworthiness Description
- Operations Manual/QRH Provisions
- MEL, Maintenance Provisions and Training
- EFVS Operating Procedures
- Training Proposal

# OpSpec Issuance

- Before issuance, the inspector will verify:
  - EFVS equipment is installed per STC
  - AFM and QRH contain EFVS provisions
  - Approval of MEL
  - Approval of the EFVS training program for flight crew and dispatchers
  - Maintenance provisions for EFVS equipment have been incorporated into the applicable maintenance programs

# PILOT TRAINING



# MD-11 HUD/EFVS Training

- **Aircraft Control/Monitoring/Situation Awareness**

- ✓ Phase I: Designed for use in non-critical phases of flight (>10K) (Sept 2008)
  - DVD 1: 45 minute DVD on components, symbology, and special modes (TCAS, etc)
  - CFM Bulletin
- ✓ Phase II: Designed for use in all phases using current regulatory guidance. (Oct 2009)
  - DVD 2: 45 minute DVD on taxi, takeoff and approach.
  - EFVS academics: 4 hour in-depth academics based on applicable Advisory Circular
  - 2 hour simulator briefing.
  - 4 hour simulator session.
- ✓ HUD/EFVS validation for Captains on subsequent CMV-1 event.
- ✓ CQ 2010, 2011 & 2012
  - 2010: Mandatory hard landing and bounce recovery training with HUD
  - 2011: Use of HUD/EFVS highly encouraged on all event sets
  - 2012: Mandatory on all monitored approaches and dedicated HUD training set

# FedEx Training Elements: Operational Credit

- Phase 1: Basic systems knowledge
  - Academics
- Phase 2: Fully trained in all phases of flight
  - Academics
  - Day 2: HUD Flight Simulator
  - Day 3: EFVS Flight Simulator
  - Skills include: Crosswinds, windshear, visual approach, low visibility, missed approach, varying light conditions etc.
- Operating experience and tracking requirements
- High Minima Phase

# CLOSING THOUGHTS

# Lessons Learned at FedEx

- Support from crews is everything
  - Fundamental change to operations
- Flight Operations Safety Assessment
  - Example: Analysis of events at DA/MDA
- Image Alignment/Process/Controls

# Regulatory Challenges

- International Harmonization
  - Minima credit (Taxi, Takeoff, Landing)
  - Equipment Requirements
  - Training requirements/elements
  - Supporting regulations/inspector guidance
- Future Planned Capability
  - EFVS to touchdown
  - Equivalent Visual Operations
  - Synthetic Vision/Combined Vision System
  - NextGen and SESAR must account for these future capabilities

# Civil Aviation Development Impacts

- Airport Approach Infrastructure Investment
  - Upgrade to CAT2/CAT3 is expensive and sometimes impossible
  - The pay-back is uncertain for airport
- Aircraft EVS Investment
  - Relatively small investment
  - Can achieve minimums like CAT2/CAT3
  - Have benefits in flight safety and operational reliability
  - Airlines to make the cost and benefit trade-off

# Questions?



Thank you!

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Express