NASA Dryden Flight Research Center
C-17 Research Overview

NASA Dryden Flight Research Center
Agenda

2006 Activities
  – T-1 Engine #3 PHM Instrumentation refurbishment & NASA Instrument Data System Upgrade

Current Activities
  – IVHM Propulsion Health Management

Future Work
  – CEV Parachute Assembly System Tests
2006 was a year for reorganization for NASA’s Aeronautics Research Missions Directorate. There were no flights or research involving the C-17.

NASA Dryden used the time to refurbish the existing instrumentation and wiring on the C-17A T-1 aircraft, Engine No. 3:

- Replaced damaged wiring
- Removed obsolete wiring
- Recalibrated instrumentation
- Rewired NASA Instrument System Racks
Acoustic and Vibration Sensors

Hi & Lo Freq Vibration

SWAN Acoustic

Hi & Lo Freq Vibration

SWAN Acoustic

Hi Freq Tri-ax Vibration

Hi Freq Vibration

Hi Freq Vibration

Hi Freq Vibration

Hi Freq Vibration

Hi Freq Vibration

SWAN Acoustic
Gas Path Sensors

IDMS Sensor
Station 2.5 Probe (New)
Burner Pressure Probe (New)
EDMS Sensor (Not Operational)
NASA Instrumentation System Racks

Omega PHM Decom and Thin Client
SWAN system
Operator Displays
Metrum Model 64 Recorder and MUX
Omega PHM Thick Client

May 23, 2007 NASA Dryden Flight Research Center
NASA C-17 Simulator

NASA Dryden Flight Research Center
Current Activities

• Integrated Vehicle Health Management - Propulsion Health Management

NASA PHM Flight Objectives:

– Damaged Aircraft Good Engines (DamAGE) Project Compressor Mapping: NASA will record compressor flow, temperatures, and pressures at the inlet and exhaust of the High Pressure Compressor (HPC) in order to calibrate an engine model for Glenn Research Center

– IVHM Data Fusion: Flight data collected from existing sensors, advanced PHM sensors, and ARINC 429 available signals will be utilized to develop Models, Analysis Methods, and Information Fusion Algorithms, and to develop real-time data publishing and data mining capabilities

– Evaluation of Propulsion Control Algorithms: NASA will use an existing USAF Veridian laptop to monitor all 1553 bus traffic from Mission Bus 2 at the crew rest area, record selected 1553 bus data for use in propulsion control algorithms, evaluate algorithms for display purposes only loaded into the USAF Veridian laptop

NASA C-17 assets are being developed into an integration (V&V) platform for NASA developed IVHM technologies
Future Work

• **Crew Exploration Vehicle (CEV) Parachute Assembly System Tests (CPAS):**

**CPAS Goals:**
- Verify that the decelerator system for the CEV functions as designed
- Collect data to verify predictive computer simulation models
- Demonstrate repeatability of the system’s performance
- Build confidence in the CPAS design for a man-rated deceleration system

**CPAS Objectives:**
- Up to 30 single-chute tests using a C-130E/H, C-17A, or helicopter
- 15 full-system tests through Low Velocity Air Drops (LVAD) from an AFFTC C-17 aircraft

**Nominal Schedule:**
- FY 2007 - 2008 - Generation 1 testing
- FY 2009 - 2010 - Generation 2 testing and Qualification
“Lawn Dart”
Parachute Test Vehicle