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Rapid Modular Software Integration (RMSI)

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Overview

- RMSI Overview
- Future Airborne Compatibility Environment (FACE™)
- Analog Computer Rehost
- Integration of Modular Components
- Demonstration Setup
- Results

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RMSI Overview

- AFRL-funded initiative to demonstrate software compartmentalization using FACE™/ARINC 653
- A-10C test bed supports concepts for future sustainment-focused cockpit enhancement
- Rehosted flight critical alpha mach computer into common hardware with COTS moving map application and bad actor test software
- Created specification for new A-10 FACE™-based subsystem to support sustainment goals
- Integrated COTS processor box and COTS signal data converter into A-10 system integration laboratory

Successfully Demonstrated

- Rehost of obsolete analog avionics
- Plug and play small software "apps"
- Reduce software integration and test
- Improved fault tolerance

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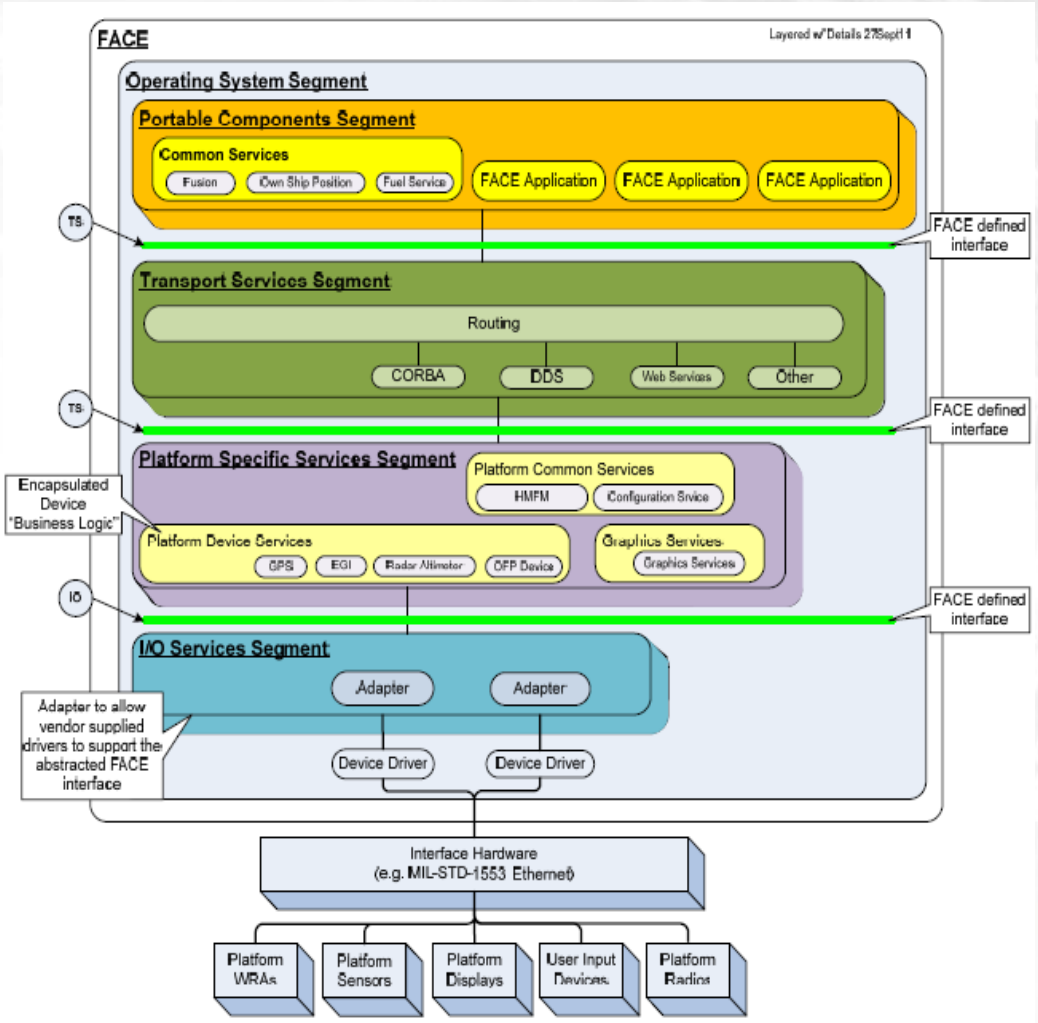
FACE™

- FACE™-based software compartmentalization provides a modular approach for new development and sustainment
- "App"-like approach allows software module reuse and commonality across platforms
- Major segments are time and space partitioned to ensure safe non-interfering operation
- Reduces sustainment and development costs
- Shortens software regression test cycles



Source: Technical Standard for Future Airborne Capability Environment (FACE™) Edition 2.0 (https://www2.opengroup.org/ogsys/catalog/c137)

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Analog Computer Rehost

- Rehosted A-10 alpha mach computer (AMC)*
  - Part of the secondary flight control system
  - Receives air pressure and lift data
  - Operates leading edge slats to improve high angle of attack airflow to engines
  - Provides engine and stall tones to pilot

- New system runs entirely in FACE™-based software architecture
- Created A-10 integrated FACE system (AIFS), a new A-10 subsystem
- AIFS provides an infrastructure for processing power and analog signal data for FACE™-conformant software modules on the A-10

*Technical Description Source: Chase, B. (2015, March/April). Portable Automated Test Station: Using Engineering-Design Partnerships to Replace Obsolete Test Systems. *CrossTalk*, pp. 4-7.

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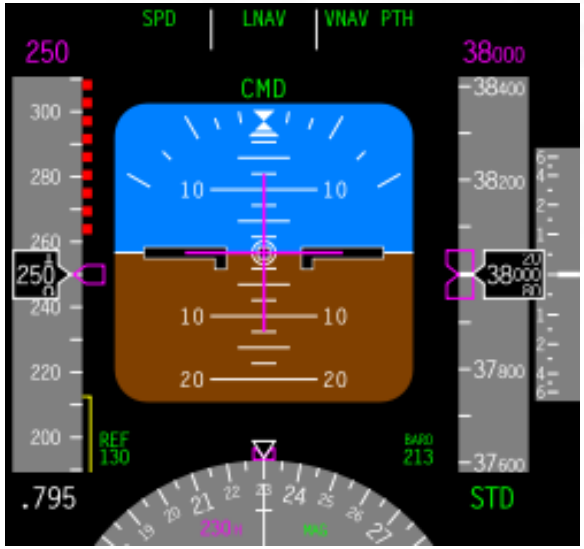
Modular Component Integration



- Integrated “off the shelf” modular components to demonstrate interoperability of custom software with existing software from vendors
- Added primary flight display to demonstrate possible solution to legacy gauge sustainment in a safety critical software environment
- Off the shelf moving map component demonstrates enhanced situational awareness capabilities and support for new or enhanced software capabilities of AIFS

Source: Defense Media Activity
(http://media.dma.mil/2007/Jun/27/2000477215/670/394/0/062607-F-0602B-100.JPG)

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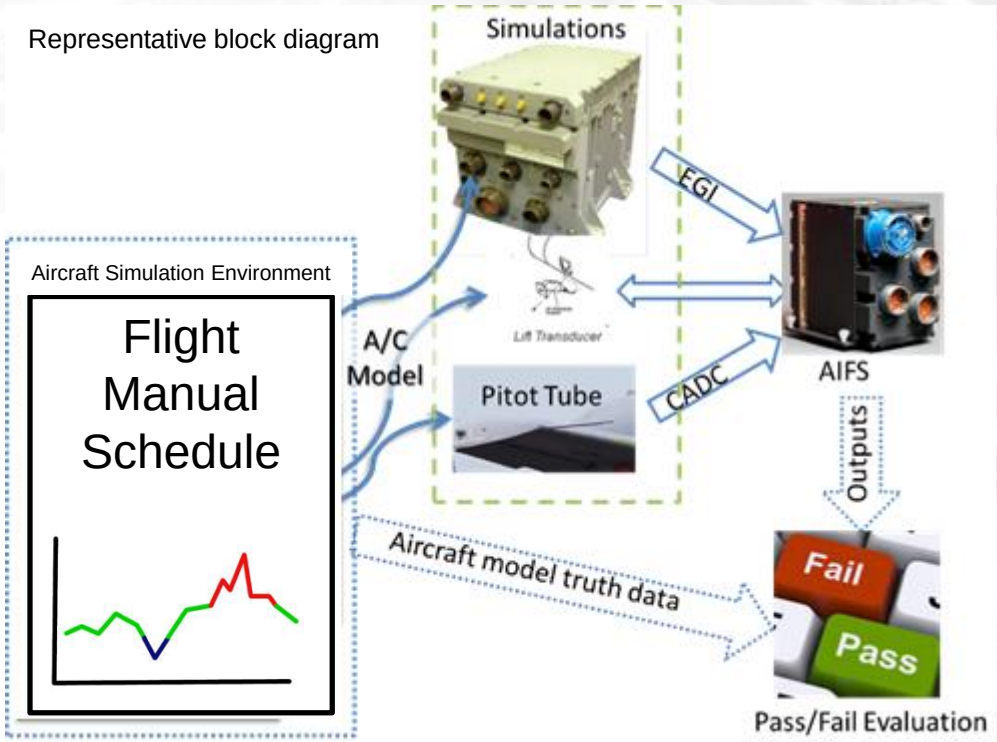
Demonstration Setup

- Lab demonstration utilized existing A-10 system integration lab at Lockheed Martin-Owego
- Mixture of real and simulated hardware ensured aircraft representative operation
- Added “bad actor” components to demonstrate modularity
- Tested each component
  - Primary flight display
  - AMC rehost
  - Moving map
  - Bad actor

Representative block diagram



A/C: Aircraft
CADC: Central Air Data Computer
EGI: Embedded Global Positioning System Inertial Navigation System

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Results

- Good demonstration. All components demonstrated expected results.
  - COTS components successfully executed in A-10 environment
  - AMC software met or exceeded performance of legacy hardware
  - Bad actor software did not compromise the integrity of safety-critical items
- Potential Way Forward:
  - Install AIFS on test jet to demonstrate system in operational environment
  - Rehost additional analog components into software
  - Integrate AIFS with A-10 sustainment roadmap for legacy systems
- Key takeaways:
  - FACE™ provides significant advantages to platforms in sustainment
  - RMSI work can transition to platforms other than A-10
  - Modularized, open architecture software allows multiple vendors to provide components with minimal interoperability concerns
  - Future systems benefit from a FACE™-based approach in terms of additional safety, reduced lifecycle costs and increased commonality

Questions?