

Role of Multi-Mode Multi-Function Digital Avionics in the Future NAS

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Cary Spitzer - Update on Integrated Modular Avionics
SC-200

- Problem:

- Current avionics are generally: not interoperable across CNS modes and national standards; expensive to upgrade and certify; not easily reconfigurable for new functions and/or modes; and not able to provide user-selected integration of C, N, S and management functions.
- The number of waveforms (both new and legacy) is beginning to overwhelm ability to fit aircraft with new capabilities.
- A new, cost-effective methodology to certify avionics is needed (both initial and subsequent for added waveforms).

- Objective:

- Develop an architecture and prototype for multi-function multi-mode digital avionics (MMDA) that demonstrate: interoperability with international standards and operational modes; low life-cycle cost to equip/modify; compliance with existing and next generation air-ground and air-air CNS requirements & functions; and compliance with redundancy, certification, security and safety standards.

Introductory Remarks

- Introduction by Mike Harrison
- Tutorial by Cary Spitzer on SC 200
- Overview of business case by Mike Harrison

- Which class of aircraft will most likely have the most immediate benefit from application of a flexible, open standard based, integrated modular avionics approach, and why?
 - High end GA (Rob Morgenstern – MITRE CAASD)
 - Cargo airlines
 - Global operators
 - Retro-fit or original equipment?

Barriers:

- Cost,
- Requirement for more functionality,
- Ease of use,
- Pushback from existing vendors due to existing avionics (proprietary content)

Key Issues:

- Antenna characteristic

Stakeholders

- Manufacturer, User, Big OEMs (air-framers), Installers & maintainers, Airports, Air traffic service providers

- Accepting the future vision of an aircraft being a “Node-in-the-sky”, what new functions or capabilities will be required for an integrated modular avionics system to meet this vision?
 - Weather info (Uplinks & downlinks)
 - Dynamic routing for a network (cost/speed/availability – QoS)
 - QoS, Policy, Decision making
 - Discovery info middleware
 - Safety assessment function
 - Ability to receive dynamic changes in airspace

Barriers:

- Graceful degradation, self healing

Key Issues:

- Human factors
- Hardware variations
- System configuration management
- System recovery from crash, faults

Stakeholders

- Info providers, ATSP, FAA, JPDO, Airlines, ISPs, JEPPESON, Airborne Internet Consortium

- What are the key barriers in the development of a (Technical Standard Order) TSO'd open architecture and will this approach enable the successful acceptance of a software based, integrated modular avionics system?
 - Standards development duration
 - Proprietary OS
 - Encourage NASA to foster a team that includes DO 178B experience

Barriers:

- Overcoming certification culture

Key Issues:

- Integrating CNS technologies in a single box
- Safety analysis to support RMA
- Defining ARINC standard
- Form, fit, function standards

Stakeholders

- Info providers, ATSP, FAA, JPDO, Airlines, ISPs, JEPPESON, Airborne Internet Consortium, OS OEMs, Industry committees

- Open standards and commercial technology such ARINC 653, DO-178, Real-Time OS's, etc... exist now, what are the work in progress or gap areas that need further standardization for developing an open architecture for integrated modular avionics?
 - ARINC 653 is an API specification
 - Go find an OS standard
 - Absence of ICAO standard
 - List of standards to adopt/adapt

Barriers:

- Use of standards outside aviation's purview
- Getting flight standards to replace legacy ones
- New systems are held to higher standards than existing systems
- Aircraft equipment MEL

Key Issues:

- Large air-framers require standards to conform to their specific requirements beyond industry levels

Stakeholders

Other Statements

- RFI should express NASA outline in the requirement for proprietary rights
- RFI should require certification experience from team players
- A pre-bid conference/workshop between issuance of RFI & RFP is warranted
- Need for a high level MIR