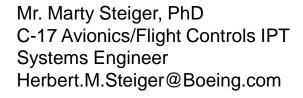


# C-17 Transition to Criteria-based Airworthiness Certification







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# **Program Airworthiness Certification History**

- Jan/1995 C-17 Initial Operational Capability (IOC)
- May/1995 Official certification record from USAF released after FCA/PCA/FQR conducted in March
  - Letter 2108-95-2708, dated 09 May 1995
- Jul/2003 C-17 Aircraft airworthiness certified by ASC/YC (P-70)
  - AFPD 62-6, USAF Aircraft Airworthiness Certification
  - Legacy system certification procedure in MIL-HDBK-514 (OSS&E)
- 2010 AFPD 62-6 / AFI 62-601 updates on the horizon
  - Design-based airworthiness certification based on MIL-HDBK-516 criteria
    - » TACC/MACC is certification basis
  - ASC/EN as independent Technical Airworthiness Authority (TAA)
    - » Approval authority for TACC/MACC



# **TACC/MACC Scope**

- Tailored Airworthiness Certification Criteria (TACC)
  - Documents airworthiness criteria, requirements, and methods of compliance (MOC) used in development of an air vehicle system
- Modification Airworthiness Certification Criteria (MACC)
  - Documents airworthiness criteria, requirements, and methods of compliance used in development of a reportable modification
  - MACC is a transient document folded into TACC



## C-17 Block Upgrade/Reportable Modification

- C-17 has on-going Air Vehicle changes/upgrades:
  - PE/PI (Performance Enhancement/Product Improvement) projects
  - GSP (Globemaster III Sustainment Partnership) projects
  - A C-17 Block Upgrade is a configuration change to implement new or improved capabilities resulting from multiple projects (reportable modification)
- C-17 reportable modifications will be captured in a MACC for each Block Upgrade
- C-17 developed a TACC using 516B (released in 2005, superseded 516A)
  - A baseline for future MACCs
  - Risk reduction/complete learning



# C-17 TACC – SG Experience

- 2005-2007 TACC Development Challenges
  - Insufficient familiarity with MIL-HDBK-516B criteria, C-17 specifications, and their relationships
  - Inconsistent traceability analysis
  - Legacy systems documents not leveraged to support analysis
    - » Criteria not accounted for when not directly traceable to SS & AVS
  - MOCs not adequately addressed
- 2008 Reverse trace to ensure that all C-17 top level specs had been considered
  - Increased understanding of 516 scope
    - » Accounted for more criteria
  - Identified mismatched system/subsystem mappings between 516 and C-17 specs
  - Discovered spec appendices were omitted



## C-17 TACC – Joint Initiative

**NDIA** 

## 2008 - SG & Boeing initiated joint TACC development

- Small expert team approach
  - » Familiarity with 516 criteria and C-17 specs/design, process, and documents
  - » Consistency control on traceability and MOC analysis
  - » Experience with legacy system airworthiness process
- Used DOORS tool to
  - » Establish a controlled, structured environment
  - » Facilitate traceability management and reporting
  - » Ensure data integrity
  - » Provide reusability for future MACCs



# C-17 TACC – Approval

- May/2009 SG signed C-17 TACC, establishing a baseline for future MACCs
  - Critical Traceability Documented
  - Environment Established
  - Corporate Knowledge Enhanced
  - FMS Support (Air-to-Air Refuel, Airdrop AW Reviews)
  - Cultural Change
    - » Change in documentation method for Airworthiness
    - » Complying with the Intent of modern guidance



## C-17 Airworthiness Considerations

- Reportable modification requires Airworthiness Plan, IAW AFI 62-601
  - Approach to obtaining and maintaining airworthiness certification, including Risk Plan
  - Certification basis development, coordination, and approval process
  - First flight review activities and flight test program envelope expansion approach
  - Description of airworthiness related entrance and exit criteria for major program reviews
- Final MACC for TAA approval required to show
  - MOC verification References
  - Summary of any noncompliance to the certification basis along with an estimate of the associated risk



## Potential Risk Items/Initiatives

- Potential areas for risk analysis
  - 4.2 Tools and databases
  - 4.6 Configuration identification
  - 4.7 Configuration status accounting
  - 14.3 Software safety program
  - 15.1 Air vehicle processing architecture
- C-17 initiatives making incremental process improvements
  - System level AIRVER (Airworthiness Verification)
  - Software Safety Assurance Plan
  - Ground test facility qualification for system safety requirements



## **Future Program Airworthiness Activities**

- Develop an Airworthiness Plan
- Create an Operational Instruction for analyzing reportable modifications
- Develop MACC as airworthiness certification basis for Block Upgrade
  - Start with the C-17 TACC
    - » Add/revise requirements traceability
    - » Update impacted MOC's
  - Leverage on existing setup in DOORS
- Continue C-17 process improvements



## **Conclusion**

- C-17 TACC development is beneficial
  - Critical learning experience, facilitates project training
  - Baseline for MACC generation
  - Supports FMS customers
- C-17 system specs/design, discipline, processes, and documents demonstrate strong relationships with 516 criteria
- C-17 is making incremental process improvements
- C-17 airworthiness moving towards latest industry standards by transitioning to 516B