



C-17 Transition to Criteria-based Airworthiness Certification



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Program Airworthiness Certification History

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- **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

NDIA

- **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

NDIA

- **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- **C-17 developed a TACC using 516B (released in 2005, superseded 516A)**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

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- **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

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- **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

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- **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

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- **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

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- **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

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- **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

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- **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**