



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE LIFE CYCLE MANAGEMENT CENTER
WRIGHT-PATTERSON AIR FORCE BASE OHIO

BULLETIN
AWB-325
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United States Air Force (USAF) Airworthiness Bulletin (AWB)-325

Subject: Communications, Navigation, Surveillance/Air Traffic Management (CNS/ATM) Compliance Assessment Process

Attachments: (1) Glossary of References and Supporting Information
(2) Sample Certification Basis (CB) tailoring

- 1. Purpose:** Provide interim instructions for the assessment and approval/certification of CNS/ATM functionality on USAF air systems. This bulletin will be revised or rescinded upon publication of an updated Air Force Instruction (AFI) 63-137, *Assurance of Communications, Navigation, Surveillance/Air Traffic Management (CNS/ATM), Navigation Safety, and Next Generation Air Transportation System (NextGen) Performance*, which will reflect this streamlined process as detailed herein. To the extent AFI 63-137 and this bulletin's directions are inconsistent, the information herein prevails.
- 2. Office of Primary Responsibility (OPR):** USAF Airworthiness Office, AFLCMC/EZSA (USAF.Airworthiness.Office@us.af.mil).
- 3. Applicability:** All air systems acquiring, integrating, or modifying CNS/ATM capabilities. The Program Manager (PM) determines when these processes and procedures apply to Commercial Derivative Aircraft maintaining FAA type certification.
- 4. Background:**
 - 4.1 USAF CNS/ATM compliance assessment and airworthiness (AW) approval were previously accomplished as two separate processes. The current AFI 63-137 prescribes a Performance Assessment and Letter of Compliance (LOC) process to ensure proper air system CNS/ATM performance for mission execution in civil controlled airspace. Air Force Policy Directive (AFPD) 62-6, *USAF Airworthiness*, establishes policy to ensure USAF air systems safely attain, sustain and complete flight, to include all of the CNS/ATM functionalities necessary for AW. Both CNS/ATM and AW processes operate in a similar fashion. Both processes include establishment of a Certification Basis (CB) from appropriate standards/regulations, verification of requirements in accordance with proven Systems Engineering procedures, development of required artifacts by air system Program Offices (POs), analysis of PO artifacts by domain Subject Matter Experts (SMEs), and issuance of appropriate approvals and limitations. Compliance with two similar processes, one for CNS/ATM and one for AW, creates a duplication of effort and adds cost for POs.
 - 4.2 AFLCMC/EZA and AFLCMC/HBA collaborated to develop a single streamlined process for the assessment of USAF air system CNS/ATM capabilities. The tenets are:

- a. AW products (AW Plan, CB, Compliance Report, and AW Flight Authorization) will incorporate CNS/ATM capabilities and will become the approving artifacts documenting assessment of, and compliance with, CNS/ATM performance requirements.
- b. CNS/ATM Tailored Performance Matrices (TPMs) will be included in the CB, and are required for new air systems and both reportable and non-reportable modifications.
- c. Showing compliance with CNS/ATM performance requirements remains the responsibility of the weapon system PO. One way of showing compliance (either partially or in full) is to include a CNS/ATM Performance Assessment Report (PAR), as described in AFI 63-137, as a Compliance Report artifact. The PAR summarizes compliance of TPM requirements, provides reference to where detailed requirement verification documentation can be found, and identifies capability deficiencies.
- d. The AW of CNS/ATM capabilities, as documented in the TPM(s) requirements section, will be evaluated in accordance with MIL-HDBK-516 criteria by cognizant engineers IAW the established AW process.
- e. Approval of AW products which incorporate CNS/ATM capabilities will follow the same delegated authority as the normal AW process.

4.3 This bulletin describes the unified process incorporating all CNS/ATM assessment and approval/certification activities within the existing AW approval process.

5. Process: In addition to the normal AW process, the steps below shall be followed to incorporate development, assessment and approval/certification of all acquired, integrated, or modified CNS/ATM capabilities into AW products.

5.1 AW Plan. PMs and Chief Engineers (CEs) shall document the required activities to obtain approval/certification of CNS/ATM capabilities. The new and/or modified capabilities shall be considered when completing an Airworthiness Determination Form.

5.2 CB. PMs/CEs shall incorporate TPMs into the CB.

- a. PMs/CEs shall obtain a Generic Performance Matrix (GPM) for each specific CNS/ATM capability by contacting the AFLCMC/HBAG Organizational Mailbox: AFLCMC.CNS.ATMCOEOffice@us.af.mil.
 - (1) AFLCMC/HBAG will continue to track and monitor CNS/ATM capability standards and generate associated GPMs, as applicable.
 - (2) Updated GPMs will identify/cross-references to all non-Communications, Navigation, and Identification (CNI) MIL-HDBK-516 sections impacted by the CNS/ATM capability and clearly identify CNS/ATM performance requirements that fall under the purview of the associated domain SMEs. The cross-reference will identify subject areas where PO staff should consult with the appropriate

SME(s) to discuss the approach for showing compliance with the applicable requirements. These CNS/ATM performance requirements shall be evaluated in accordance with the Standard(s) and Method(s) of Compliance (MoC) established for the non-CNI criterion (criteria).

- b. PMs/CEs shall prepare a TPM for each specific CNS/ATM capability by tailoring the associated GPM. The TPM shall define CNS/ATM performance requirements, verification methods, and expected artifacts.
- c. PMs/CEs shall ensure all impacted MIL-HDBK-516 criteria identified in the TPM are marked as “applicable” in the CB.
- d. PMs/CEs shall tailor the Standard and MoC of the appropriate MIL-HDBK-516 criterion in Section 11.1, Avionics Architecture, by incorporating the TPM by reference in the CB. Tailoring must be accomplished IAW MIL-HDBK-516C paragraph 1.2.1 and AWB-004A, *Development of an Airworthiness Certification Basis*.
 - (1) The specific MIL-HDBK-516 Section 11.1.1 criterion that is to be tailored in the CB is dependent on the Communication, Navigation, or Surveillance category of the CNS/ATM capability being implemented.
 - (a) For CNS/ATM communication requirements, the appropriate MIL-HDBK-516 criterion to tailor is 11.1.1.4, Communication Subsystem.
 - (b) For CNS/ATM navigation requirements, the appropriate MIL-HDBK-516 criteria to tailor is either 11.1.1.1, Air Data System, or 11.1.1.5, Navigation Subsystem. The Standards for these two criteria provide guidance on CNS/ATM capabilities encompassed by the criterion (e.g., criterion 11.1.1.1, Air Data System identifies Reduced Vertical Separation Minimums (RVSM) capabilities as being appropriate to this section and criterion 11.1.1.5, Navigation Subsystem identifies Required Navigation Performance (RNP) capabilities as being appropriate to this section).
 - (c) For CNS/ATM surveillance requirements, the appropriate MIL-HDBK-516 criterion to tailor is 11.1.1.6, Surveillance Subsystem.
 - (2) Tailored Standards and MoCs should indicate the requirements and verification methods, respectively, for each specific CNS/ATM capability. Examples of this tailoring can be found in Attachment 2.
- e. CB approval constitutes TPM concurrence.

5.3 AW Compliance Report. PMs/CEs shall document verification of CNS/ATM capabilities in the AW Compliance Report.

- a. Delegated Technical Authorities shall assess integrated system performance for each acquired, integrated, or modified CNS/ATM capability with respect to the CB.

b. PMs/CEs shall incorporate substantiating compliance artifacts (e.g., a PAR) into the TPM and AW Compliance Report.

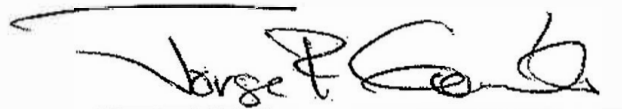
5.4 **AW Flight Authorization.** PMs shall obtain an AW Flight Authorization that approves the acquired, integrated, or modified CNS/ATM capabilities. The AW Flight Authorization is issued in lieu of a LOC and identifies restrictions, limitations, or operational workarounds as necessary.

5.5 **Operational Approval.** PMs shall provide the AW Flight Authorization to the using Major Command (MAJCOM) to facilitate operational approval IAW AFI 11-202V3, *General Flight Rules*.

6. Other Considerations:

6.1 It is highly encouraged for PMs/CEs of air systems acquiring, integrating, or modifying CNS/ATM capabilities contact AFLCMC/EZA or AFLCMC/HBA to seek technical guidance. AFLCMC/EZA or AFLCMC/HBA can assist POs with CNS/ATM matrix tailoring, aid in the understanding of compliance requirements, and advise on potential compliance verification methodologies.

6.2 The timelines for CB development and approval identified in AWB-002A, *Airworthiness Planning*, are critical, especially for CNS/ATM modifications.



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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFI 11-202V3, *General Flight Rules*, 10 Aug 2016
 AFI 63-137, *Assurance of Communications, Navigation, Surveillance/Air Traffic Management (CNS/ATM), Navigation Safety, and Next Generation Air Transportation System (NEXTGEN) Performance*, 29 Mar 2012
 AFD 62-6, *USAF Airworthiness*, 11 Jun 2010
 AWB-002A, *Airworthiness Planning*, 17 May 2011
 AWB-004A, *Development of an Airworthiness Certification Basis*, 17 Jun 2011
 MIL-HDBK-516C, *Airworthiness Certification Criteria*, 12 Dec 2014

Abbreviations and Acronyms

AFI – Air Force Instruction
AFLCMC – Air Force Life Cycle Management Center
AFPD – Air Force Policy Directive
AW – Airworthiness
AWB – Airworthiness Bulletin
CB – Certification Basis
CE – Chief Engineer
CNI – Communications, Navigation, and Identification
CNS/ATM – Communications, Navigation, Surveillance/Air Traffic Management
GPM – Generic Performance Matrix
GPS – Global Positioning System
IAW – In Accordance With
LOC – Letter of Compliance
MAJCOM – Major Command
MoC – Method of Compliance
NextGen – Next-Generation Air Transportation System
OPR – Office of Primary Responsibility
PAR – Performance Assessment Report
PM – Program Manager
PO – Program Office
RNP – Required Navigation Performance
RVSM – Reduced Vertical Separation Minimums
SME – Subject Matter Expert
TPM – Tailored Performance Matrix
USAF – United States Air Force

Attachment 2



Certification Basis Tailoring Example



AFLCMC... Providing the Warfighter's Edge

This is an example of incorporating a CNS/ATM Tailored Performance Matrix (TPM) into a program's Certification Basis

- This example addresses a program with a Required Navigation Performance (RNP) requirement
- MIL-HDBK-516C criterion 11.1.1.5 is the only criterion that is tailored; it explicitly discusses the RNP requirement and the need to tailor the appropriate performance matrices
- Other MIL-HDBK-516C criteria will be impacted by RNP requirements; however, no specific tailoring is proposed for these criteria. Information will be included in the generic matrices identifying requirements where consultation with appropriate MIL-HDBK-516C Subject Matter Experts is recommended to establish compliance strategy

11.1.1.5 Navigation subsystem.

Criterion: Verify for the navigation subsystem that the number and type of sensors, data processors, data buses, controls and displays, and communication devices are adequate for safety of flight considerations, including performance, integrity, availability, and continuity of service requirements for long range reference, local area reference, and landing/terminal reference.

Standard: The navigation system provides the vehicle and/or operator(s) all needed navigation information with sufficient accuracy and reliability to satisfy safety of flight requirements. The amount, quality and refresh rate of information needed for safety of flight are defined in the design information. No single navigation subsystem component failure causes the propagation (or absence) of information resulting in an adverse safety of flight condition (for Army; see also 14.2 of this document). Navigation subsystem performance, integrity, availability and continuity of service meets air vehicle Required Navigation Performance (RNP), Vertical Navigation (VNAV), Basic Area Navigation (BRNAV), Precision Area Navigation (PRNAV) requirements (as applicable). RNP, VNAV, BRNAV, and PRNAV performance matrices are tailored to the specific needs of the program. **Program specific RNP performance requirements are documented in the RNP Tailored Performance Matrix (Document Reference).**

Black text = Baseline MIL-HDBK-516C Text Red text = Tailored Text

- No Tailoring to Criterion
- No changes to baseline Standard are recommended
 - Explicitly discusses RNP (and other CNS/ATM navigation requirements)
 - Explicitly discusses the need to tailor the appropriate matrices for the needs of the program
- Specific requirements for the RNP are amended to the baseline Standard



Certification Basis Tailoring Example



AFLCMC... Providing the Warfighter's Edge

Method of Compliance: Performance of the navigation system safety of flight components is verified through analysis and laboratory test. Navigation System safety of flight redundancy and performance are validated through system level analysis, simulation and test. Safety Hazard Analysis verifies that all navigation system related failures have acceptable risk levels. Safe operation of the air vehicle following any single navigation system component failure is verified using FMECA. Laboratory based failure mode tests verify acceptable performance for single failure operation. On aircraft ground testing verifies performance and redundancy of the navigation system safety critical functions. Flight testing verifies previous analysis and testing. For example, when a Kalman filter is used in an integrated navigation system, a representative subset of operational flight profiles is chosen via analysis to demonstrate direct compliance to performance requirements as well as validate navigation system analysis simulations. Once validated these navigation system simulations are used to verify performance for all other operational flight profiles not directly tested. **RNP performance is verified in accordance with the verification methods established in the RNP Tailored Performance Matrix, and verification results will be reported in program office documentation delivered with the Airworthiness Compliance Report.**

Black text = Baseline MIL-HDBK-516C Text Red text = Tailored Text

- No changes to the baseline MoC are recommended—these compliance efforts are still needed
- Specific compliance efforts for the RNP requirement are amended to the baseline MoC
 - TPM is incorporated by reference
 - TPM includes verification methods for RNP requirements
- Documentation could potentially include a Performance Assessment Report (as described in AFI 63-137)