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United States Air Force (USAF) Airworthiness Bulletin (AWB)-004

Subject: Development of an Airworthiness Certification Basis

Attachments: (1) Glossary of References and Supporting Information

(2) Example of a Certification Basis for New Developmental Aircraft or a Modification

(3) Example of a Certification Basis for Commercial Derivative Aircraft (CDA)

- 1. Purpose:** This bulletin provides instructions to Program Managers (PMs) and Chief Engineers (CEs) for establishing the certification basis for aircraft when following the design-based assessment procedures leading to a military certification of the type design. The essential elements of the certification basis development process apply to both new aircraft system acquisitions and to those modification programs that affect airworthiness of the aircraft system.
- 2. Office of Primary Responsibility (OPR):** USAF Airworthiness Office (ASC/EN) is the OPR. Comments, suggestions, or questions on this bulletin should be emailed to the USAF Airworthiness Office Mailbox (ASC.ENSI.Mailbox@wpafb.af.mil).
- 3. Background:** The USAF airworthiness certification process is predicated upon having basic knowledge of an aircraft (or modification) design. Once top level design configuration concepts are determined, the certification basis may be developed and approved to provide the tailored set of criteria against which the design will be assessed using approved standards and methods of compliance. Throughout the engineering development process, the design will be subjected to various analysis, testing (e.g., component, ground, and flight), demonstrations, inspections, and simulations to assure “show compliance” to the approved certification basis. When compliance to the certification basis is shown an independent authority may issue the appropriate design approval documentation.
- 4. What is a Certification Basis?:** The certification basis establishes the foundation of all tailored airworthiness certification criteria (TACC) and modification airworthiness certification criteria (MACC) documents and it provides the “measure of merit” against which a design is judged for airworthiness.

The contents of the certification basis include the set of approved airworthiness certification criteria, standards, methods of compliance, and exemptions that apply to a specific aircraft system. It is derived from ASC/EN MIL-HDBK-516B, *Airworthiness Certification Criteria Expanded Version*. The criteria themselves are typically qualitative in nature (i.e., verify that XX is safe...) and thus a standard and method of compliance must be identified for each to provide quantitative measures of “safe”. One might equate the establishment of a certification basis to that of a high jump competition in track and field. For example:

- a. **Criterion:** The criterion is that the athlete must jump over the bar without knocking it off. This is not debatable or tailorable.
- b. **Standard:** How high is the bar set? Note that the bar may be set at different heights depending upon the type of athlete (e.g., male, female, age group, etc). Similarly, for the same given airworthiness criterion, the standards for a fighter aircraft may be significantly different than that required for a tanker aircraft.
- c. **Method of Compliance:** Generally, how must the athlete go over the bar? Must they go over the bar and have the exact clearance measured (test)? Can they go over the bar and have no measurement beyond that done (demonstration)? Can they simply say “I have done this before and will provide proof” (similarity)?
- d. **Exemptions:** Extenuating circumstances might arise on a certification effort such that one or more criterion will never be met. The process for requesting an exemption to a specific airworthiness criterion is described in USAF AWB-019, *Exemptions and Waivers*. It also applies to applicable Federal Aviation Administration (FAA) Federal Aviation Regulation (FAR) requirements for passenger carrying commercial derivative aircraft (CDA).

5. Certification Basis Development: With an understanding of the aircraft’s general design and functionality/mission, accomplish the following:

- a. Select and document the applicable criteria from ASC/EN MIL-HDBK-516B Expanded, Airworthiness Certification Criteria. Evaluate each criterion in ASC/EN MIL-HDBK-516B Expanded for applicability to the design to be certified. Identify the applicable criterion. Do not modify the criteria. If a portion of a considered criterion applies, and a portion does not apply, include the applicable portion in the certification basis and provide justification for the non-applicable portion.

NOTE: The ability of an aircraft design to meet a specific criterion has no bearing on the determination of applicability of that criterion, or on the standard the design must be shown to meet, or on the method of compliance. Establishment of the certification basis

is totally independent of the compliance determination which will come later on in the certification process.

- b. Document the rationale for all criteria deemed not applicable to the certification basis. Typically this is a statement regarding configuration of the aircraft systems (e.g., “This criterion is not applicable as this aircraft has no propellers.”).
- c. New “program unique” criteria may be included in the certification basis definition if suitable criteria for a specific aircraft system application cannot be found in ASC/EN MIL-HDBK-516B Expanded.
- d. For each applicable criterion, define specific standards to be met. This is accomplished by tailoring (as necessary) the recommended “standard” from ASC/EN MIL-HDBK-516B Expanded for each criterion (see 5.a Note). In the case of a fielded/legacy system, the original standard may be obtained from review of the specification performance requirements used during original design of the aircraft system.
- e. For each applicable criterion, define activities to show compliance with each standard. This is accomplished by tailoring (as necessary) the recommended “method of compliance” from ASC/EN MIL-HDBK-516B Expanded (see 5.a Note). In the case of a fielded/legacy system the original method of compliance may be obtained from review of the specification verification requirements utilized during original design of the aircraft system.

NOTE: The technical airworthiness authority (TAA) requires ASC/EN MIL-HDBK-516B, Airworthiness Certification Criteria Expanded Version be used for all development and modification efforts. This version includes the “expected” standards and methods of compliance toward achieving certification. Tailoring the standards and methods of compliance to adapt to unique situations is anticipated. Attachment 2 provides an example of a certification basis for a new developmental aircraft or a modification.

6. Tasks necessary to establish the certification basis for a new, developmental aircraft and for modified aircraft systems (refer to USAF AWB-002, *Airworthiness Planning* for general instructions. and specifically to the “Airworthiness Certification Process Timeline” in its attachment 4):

- a. The PM or CE shall utilize MIL-HDBK-516 Expanded version to develop the certification basis prior to release of development acquisition packages (e.g., Request for Proposal (RFP). This should be reflected the overarching airworthiness planning approach integrated into the system’s Life Cycle Management Plan (LCMP).

- b. Define the system-level type configuration(s) to be certified: Creation of the certification basis requires having a clear definition of the general aircraft type's physical configuration to be certified and knowledge of how the aircraft will be employed to include the operational environment. The final design configuration definition is not required to develop a draft certification basis since, at this stage; a "measure of merit" is being established in which the final configuration will be assessed.

It is understood that the design will continue to be further refined throughout the development process since the certification basis is not typically finalized by the program office until the aircraft design is locked down as an output of the system Critical Design Review (CDR).

- c. The program office engineering staff should work with the ASC/EN Airworthiness Technical Directors and their subject matter experts (SMEs) to draft up a pre-contract award certification basis. This early draft certification basis, instructions to offerors, and evaluation criteria should be provided as part of the RFP solicitation package. The purpose of this early draft certification basis is to provide the offeror an understanding of the scope of effort expected in the proposal, in addition to helping the program office understand the budget that should be established to achieve certification. During the source selection, the evaluation team should consider the proposed work effort required to achieve certification when assessing the ability to meet the RFP requirements.

NOTE: The certification basis for new aircraft programs and reportable modification programs contained in the TACC or MACC documents require TAA approval prior to contract award, whether competitive or non-competitive procurement. Per AFI 62-601 the certification basis for non-reportable modifications follows the same process but is approved by the Chief Engineering/Delegated Technical Authority (CE/DTA). Per TAA direction, **Directors of Engineering (DOE/DTAs) will perform the CE/DTA non-reportable certification basis approvals (AFI 62-601, paragraph 1.6) and the associated final MACC compliance finding and approval function (see AFI 62-601, Attachment 2).**

7. Process for establishing the certification basis for a modification to a previously certified AF aircraft:

- a. The majority of aircraft in the AF inventory, as of the publication of the original Air Force Policy Directive (AFPD) 62-6, *USAF Airworthiness*, in the year 2000, were certified utilizing what is commonly referred to as the "Legacy Certification Approach." This approach was predicated upon the assumption that if an aircraft design demonstrated acceptable safety levels, adequate operations and maintenance manuals, and good configuration management processes were in place, then the aircraft design could be

deemed airworthy. The foundational assumption was that the aircraft were designed to MIL-SPECs and MIL-STDs prior to the cancellation of the policy to use these in the mid-1990s.


- b. Follow the steps outlined in paragraph 5 for the construction of a modification certification basis. This includes evaluation of each criterion in ASC/EN MIL-HDBK-516B Expanded for applicability to the modification and documentation of the rationale for all criteria deemed not applicable to the modification's certification basis. All applicable criteria will be supported with identification of the appropriate standard and method of compliance tailored (if required) for the modification.

8. Commercial Derivative Aircraft (CDA) Considerations: Military aircraft systems which utilize FAA type certification as the certification basis shall include military certification criteria derived from ASC/EN MIL-HDBK-516B Expanded only for items which are not included in the FAA issued type certification (i.e., military-unique items listed on an FAA Form 8130-31, *Statement of Conformity – Military Aircraft Form*). For more information on FAA Form 8130-31, refer to FAA Order 8110.101, *Type Certification Procedures For Military Commercial Derivative Aircraft*. FAA Type Certification Data Sheet (TCDS) and any applicable Supplemental Type Certificates (STC) suffice as the certification basis for FAA certified items and FAA certification constitutes the “show compliance” data for these items. Attachment 3 provides an example of a certification basis for a CDA.

- a. For criteria satisfied entirely by FAA certification, the standard will be “FAA Certification” and the method of compliance entry will be “FAA finding of compliance with FAA rules”. For criteria not satisfied by FAA certification, the tailored standard and method of compliance derived from ASC/EN MIL-HDBK-516B Expanded must be provided. For criteria partially satisfied by FAA certification, the aspects covered by FAA certification must be clearly defined and the remaining aspects must have the tailored standard and method of compliance entries.
- b. Some ASC/EN MIL-HDBK-516B Expanded criteria cannot be met by FAA certification. Limits to what the FAA can certify can be found in FAA Order 8110.101. Also, while each certification program is unique, experience has shown that some criteria needs more than FAA certification. These should be documented as applicable and show the tailored standard and method of compliance from ASC/EN MIL-HDBK-516B Expanded.
- c. The FAA issues Experimental Certificates (a category of special airworthiness certificates) permitting flight for a variety of purposes listed in 14CFR21.191, *Experimental Certificates*. This certificate cannot be used as a certification basis for AF CDA airworthiness certification although the data supporting the Experimental Certificate may be used to support issuing a Military Flight Release.

- 9. Military Certified Aircraft from Other Services:** Aircraft designs certified by other Services may be accepted as airworthy by the TAA, if the certification basis is known and understood and the planned AF usage is consistent with the certified configuration and operating environment. The certification basis will be the originating service's certification; however, the TAA may request data used in the previous certification process to assist in reaching a finding of compliance for USAF airworthiness certification. Refer to paragraph 1.12 of AFI 62-601 for additional instructions.
- 10. Airworthiness Certification in Jointly Managed Acquisition Programs:** The AF often participates in jointly managed programs with one or more of the other US military services either as the lead service or as a member.

For all AF-operated variants, the TAA approves the certification basis (refer to paragraph 1.13 of AFI 62-601). The AF certification basis shall be derived from ASC/EN MIL-HDBK-516B Expanded version and conform to the documentation format specified in USAF AWB-005 *TACC/MACC Document Construction and Format*. Other certification basis and documentation formats may be accepted by the TAA on a case by case basis.



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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

14CFR21.191, Experimental Certificates
 AAFP 62-6, *USAF Airworthiness*
 AFI 62-601, *USAF Airworthiness*
 USAF AWB-002, *Airworthiness Planning*
 USAF AWB-005, Tailored Airworthiness Certification Criteria (*TACC*)/*Modification Airworthiness Certification Criteria (MACC) Document Construction and Format*
 USAF AWB-019, *Exemption and Waiver Process*
 MIL-HDBK-516B Expanded Version, *Airworthiness Certification Criteria*
 FAA Order 8110.101, Type Certification Procedures for Military Commercial Derivative Aircraft
 FAA Form 8130-31, Statement of Conformity – Military Aircraft
 USAF Airworthiness SharePoint website;
<https://cs.eis.afmc.af.mil/sites/AeroEngDisciplines/Systems/Airworthiness/default.aspx>

Abbreviations and Acronyms

AAFP — Air Force Policy Directive
CDA – Commercial Derivative Aircraft
CDR – Critical Design Review
CE – Chief Engineer
DOE – **Director Of Engineering**
DTA – Delegated Technical Authority
FAA – Federal Aviation Administration
MACC — Modification Airworthiness Certification Criteria
PM – Program Manager
RFP – Request for Proposal
SME – Subject Matter Expert
STC – Supplemental Type Certificate
TAA — Technical Airworthiness Authority
TACC — Tailored Airworthiness Certification Criteria
TCDS — Type Certification Data Sheet

Terms

Certification Basis—The set of approved airworthiness certification criteria, standards, methods of compliance, and exemptions that apply to a specific air system. It is typically derived from MIL-HDBK-516, Airworthiness Certification Criteria.

Commercial Derivative Aircraft (CDA)—Any fixed- or rotary-wing aircraft procured as a commercial, FAA type certified off-the-shelf nondevelopmental item, and whose serial number is listed on an FAA Type Certification Data Sheet.

Exemption—Documentation of permanent air system design feature that does not comply with an airworthiness certification criterion in the TACC or MACC.

Modification Airworthiness Certification Criteria (MACC) Document—A document comprised of the certification basis for the modification, a description of the aircraft covered, a description of the modification, operating limitations or restrictions that apply to the modified aircraft, references to “show compliance” data, and a summary of any noncompliance with an applicable airworthiness criteria.

Program Manager (PM)—The DODI 5000.02, *Operation of the Defense Acquisition System*, designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet user’s operational needs. PMs for sub-systems support overall system objectives as required by the System Program Manager (SPM). PMs for acquisition programs are accountable for credible cost, schedule, performance, and materiel readiness to the Milestone Decision Authority (MDA). PMs addressed by this bulletin are those who are responsible for weapon systems identified in AFPD 10-9, *Lead Command Designation and Responsibility for Weapon Systems*, space systems, and programs identified on the Acquisition Program Master List and Sustainment Program Master List. PMs are assigned in accordance with AFI 63-101, *Acquisition and Sustainment Life Cycle Management*.

Tailored Airworthiness Certification Criteria (TACC) Document—It is comprised of a description of the aircraft system; the certification basis; any operational limitations or restrictions that must be implemented in order to ensure airworthiness of the aircraft; references to “show compliance” data; and a summary of any noncompliance with applicable airworthiness criterion in the certification basis.

Technical Airworthiness Authority (TAA) – The USAF official authorized to define airworthiness standards, approve the certification basis, issue findings of compliance, and issue Military Type Certificates and other flight releases (see AFI 62-601).

Type Design—Description of the physical configuration of similar aircraft systems which, from an airworthiness perspective, are functionally equivalent.

USAF Airworthiness Bulletin— Procedures, practices and requirements for executing USAF airworthiness policy as defined and published by the TAA.

Attachment 2

EXAMPLE OF A CERTIFICATION BASIS FOR NEW DEVELOPMENTAL AIRCRAFT OR A MODIFICATION

It is expected that the program office will identify the source of the tailored criteria with a statement such as “The certification basis defined by this document was derived from MIL-HDBK-516B, Airworthiness Certification Criteria, dated 26 Sep 2005.”

Some detailed criteria examples are shown below with standards and methods of compliance taken from *ASC/EN Airworthiness Certification Criteria Expanded Version of MIL-HDBK-516B*.

Para Num	Certification Criteria	Applicable (Y/N)	Rationale for Non-Applicable Criteria	Standard	Method of Compliance
13.2.1	Verify that all equipment and subsystems exhibit mutual electromagnetic compatibility.	Y		Intra-system EMC is required at the aircraft level to demonstrate that equipment and subsystems are capable of providing safety of flight in conjunction with other equipment and subsystems which are required to operate concurrently.	Aircraft system level EMC test and analysis of the test results to MIL-STD-464, section 5.2
13.2.5	Verify that the system meets the requirements for electromagnetic pulse (EMP) protection, if applicable.	N	EMP protection not required for mission.		

Attachment 3

EXAMPLE OF A CERTIFICATION BASIS FOR A COMMERCIAL DERIVATIVE AIRCRAFT (CDA)

On the System Information page, the certification basis will have the MIL-HDBK-516 and FAA information. The following is an example of a certification basis section for a CDA that has three STCs and some equipment that is not FAA certified:

The airplane is certified by the FAA Type Certificate A16WE and FAA Supplemental Type Certificates ST01087WI-D, ST01088WI-D, and ST01089WI-D. Equipment or modifications that deviated from the FAA approved configuration are documented on FAA Form 8130-31, and are certified to applicable MIL-HDBK-516B.

The following is an example of a certification basis section for a CDA airplane with all equipment FAA certified:

The airplane is certified by the FAA Type Certificate A16WE and FAA Supplemental Type Certificates ST01087WI-D, ST01088WI-D, and ST01089WI-D. The FAA certification is accepted to show compliance to applicable MIL-HDBK-516B.

Some example detailed criteria are shown below with standards and methods of compliance taken from *ASC/EN MIL-HDBK-516*.

This is an example of criteria fully met by FAA certification:

Para Num	Certification Criteria	Applicable (Y/N)	Rationale for Non-Applicable Criteria	Standard	Method of Compliance
13.2.1	Verify that all equipment and subsystems exhibit mutual electromagnetic compatibility.	Y		FAA Certification	Inspection of FAA Approving Documentation
13.2.5	Verify that the system meets the requirements for electromagnetic pulse (EMP) protection, if applicable.	N	EMP protection not required for mission.		

This is an example of criteria only partially met by FAA certification:

Para Num	Certification Criteria	Applicable (Y/N)	Rationale for Non-Applicable Criteria	Standard	Method of Compliance
13.2.1	Verify that all equipment and subsystems exhibit mutual electromagnetic compatibility.	Y		FAA Certification except for ACME-223 Radio. For ACME-223 Radio: Intra-system EMC is required at the aircraft level to demonstrate that equipment and subsystems are capable of providing safety of flight in conjunction with other equipment and subsystems which are required to operate concurrently.	Inspection of FAA Approving Documentation. For ACME-223 Radio: Aircraft system level EMC test and analysis of the test results to MIL-STD-464, section 5.2 in test report 1234-5.
13.2.5	Verify that the system meets the requirements for electromagnetic pulse (EMP) protection, if applicable.	N	EMP protection not required for mission.		

This is an example of criteria not met by FAA certification and matches that for a TACC without FAA certification:

Para Num	Certification Criteria	Applicable (Y/N)	Rationale for Non-Applicable Criteria	Standard	Method of Compliance
13.2.1	Verify that all equipment and subsystems exhibit mutual electromagnetic compatibility.	Y		Intra-system EMC is required at the aircraft level to demonstrate that equipment and subsystems are capable of providing safety of flight in conjunction with other equipment and subsystems which are required to operate concurrently.	Aircraft system level EMC test and analysis of the test results to MIL-STD-464, section 5.2
13.2.5	Verify that the system meets the requirements for electromagnetic pulse (EMP) protection, if applicable.	N	EMP protection not required for mission.		