



U.S. Department
of Transportation
**Federal Aviation
Administration**

Advisory Circular

Subject: Means of Compliance
Considerations

Date:

AC No: 21-60

Initiated By: AIR-600

1 **PURPOSE.**

- 1.1 This advisory circular (AC) provides guidance for using Means of Compliance (MOC) for a design approval or change to a design approval under Title 14 of the Code of Federal Regulations (CFR) Part 21 to show compliance with airworthiness requirements and minimum performance standards as defined in a technical standard order.
- 1.2 The AC also provides guidance on the appropriate use and limitations of the review of engineering drawings in an engineering design review as the only means to show compliance with the airworthiness requirements or minimum performance standards. Existing guidance does not discuss the limitations of a drawing review as the only MOC with the airworthiness requirements.

2 **APPLICABILITY.**

- 2.1 The guidance in this AC applies to applicants seeking approval for a type certificate (TC), amended type certificate, supplemental type certificate (STC), amended supplemental type certificate, parts manufacturer approvals (PMA), TSO authorization (TSOA), or changes to these design approvals.
- 2.2 This is a guidance document. Its content is not legally binding in its own right and will not be relied upon by the Department as a separate basis for affirmative enforcement action or other administrative penalty. Conformity with the guidance document is voluntary only. Nonconformity will not affect rights and obligations under existing statutes and regulations.
- 2.3 The FAA will consider other means of demonstrating compliance that an applicant may elect to present. Terms such as “should,” “may,” and “must” are used only in the sense of ensuring applicability of this particular MOC when the acceptable MOC in this document is used. If the FAA becomes aware of circumstances in which following this AC would not result in compliance with the applicable regulations, the Agency may require additional substantiation as the basis for finding compliance.

- 2.4 The material in this AC does not change or create any additional regulatory requirement, nor does it authorize changes in, or permit deviations from, existing regulatory requirements.

3 **RELATED MATERIAL.**

3.1 **Title 14, Code of Federal Regulations (14 CFR).**

The following Part 21 regulations are related to this AC. You can download the full text of these regulations at the [e-CFR](#) website. Subparts of Part 21 include:

- Subpart B, *Type Certificates*
- Subpart C, *Provisional Type Certificates*
- Subpart D, *Changes to Type Certificates*
- Subpart E, *Supplemental Type Certificates*
- Subpart K, *Parts Manufacturer Approvals*
- Subpart O, *Technical Standard Order Approvals*

3.2 **FAA Advisory Circulars.**

The following ACs are related to the guidance in this AC. The latest version of each AC referenced in this document is available on the FAA website at [FAA Advisory Circulars](#) and on the [Dynamic Regulatory System](#).

- AC 21-40, *Guide For Obtaining a Supplemental Type Certificate (STC)*.
- AC 21-51, *Applicant's Showing of Compliance and Certifying Statement of Compliance*.

3.3 **FAA Orders.**

The following Orders are related to the guidance in this AC. The latest version of each order referenced in this document is available on the FAA website at [FAA Orders & Notices](#) and on the [Dynamic Regulatory System](#).

- FAA Order 8110.4, *Type Certification*.
- FAA Order 8110.42, *Part Manufacturer Approval Procedures*.
- FAA Order 8150.1, *Technical Standard Order Program*.

3.4 **FAA and Industry Guide.**

The FAA and Industry Guide to Product Certification can be found at the [Information for Applicants and Design Approval Holders](#) website. The guide is located under the CPG tab.

3.5 **European Union Aviation Safety Agency (EASA).**

EASA certification specification Appendix A to AMC 21.A.15(b), *Means of compliance codes* is related to the guidance in this AC. The latest version of this document is available on the [EASA website](#).

4 **MEANS OF COMPLIANCE.**

4.1 During certification activities, there are times where more than one MOC may be required to show compliance with the applicable requirements (e.g., design review, analysis, testing, inspection, etc.). This guidance will provide a short summary of the means as outlined above.

4.2 Means of compliance, for the purposes of this AC, is a description of how compliance will be shown (ground test, flight test, analysis, similarity, or other acceptable means of compliance). The description of the means of compliance should be sufficient to determine that all necessary FAA data will be collected, and all findings can be made.

Note: For the purpose of this AC, and in conjunction with Order 8110.4 definitions, MOC are generally categorized as design review, testing, analysis, and inspection. This guidance does not prohibit the use of applicant agreed specific MOC terms used in the compliance listings/checklists. This guidance is not meant to establish an extensive list of compliance terms.

4.3 Methods of Compliance, for the purposes of this AC, are the detailed analyses, tests, or inspections used by the applicant to demonstrate compliance with the certification and validation airworthiness standards; e.g., ground test, flight test, analysis, similarity, etc. The description of the method of compliance should be sufficient to determine that all necessary compliance-related data will be collected, and all findings can be made. It includes assumptions used in applying the methodologies, and discussions of the procedures used to verify the methodologies. Methods of compliance are guidance or standards documents that the applicant may use to show compliance with the applicable regulations. Some examples include AC 23-17, Systems and Equipment Guide for Certification of Part 23 Airplanes and Airships, and AC 25-7, Flight Test Guide for Certification of Transport Category Airplanes.

4.4 **Part 21 Compliance.**

4.4.1 Part 21 requires applicants to show compliance with all applicable requirements in order to obtain FAA design approval. These requirements may reference airworthiness requirements in other Parts or TSO minimum performance standards. The description of the MOC should be sufficient to determine that all necessary compliance-related data will be collected and all findings can be made.

4.4.2 Section 21.20 of 14 CFR requires the applicant to show compliance with all applicable requirements, provide the FAA with the means by which such compliance has been shown, and certify that the applicant has complied.

- 4.4.3 Section 21.21 of 14 CFR states that applicants are entitled to a TC (or amended certificate in accordance with Subpart D) after they show compliance, the FAA finds compliance, and the FAA finds that the type design has no unsafe features. It is the FAA who determines whether the applicant has shown compliance.
- 4.4.4 During certification compliance findings review, when applicants propose specific MOC (e.g., engineering design review) and reuse designs, data, and artifacts in documenting compliance, the FAA has identified issues (i.e., airworthiness non-compliances and unsafe conditions) that require the FAA to provide this additional clarification and guidance.
- 4.5 **Engineering Design Review.**
- 4.5.1 An engineering design review, when used in showing compliance with the applicable airworthiness requirements, is an iterative process. This process evaluates a design against its requirements by the review of engineering drawings, bill of materials, design specifications, manufacturing processes, etc. For complex designs and design changes, design review is intended to be performed in conjunction with other MOC to verify and substantiate the configuration and design features. Examples of other MOC include, but are not limited to, physical tests, performance characteristic tests, operational tests, simulation, and walk-through inspections, etc. These other MOC are highly recommended to be used alongside engineering design review, such that engineering design review is not commonly used on its own. The combination of several MOC have been used and accepted for demonstrating compliance with the applicable airworthiness requirements.
- 4.5.2 An engineering design review in conjunction with other MOC (e.g., tests, analysis, or inspection) is imperative for a proposed design, or changes to a design, that are complex or interface with other components. A few examples include structural changes, autopilots, flight directors, inertial navigation systems, stability augmentation systems, stall prevention systems, wheel-brake systems, or other equipment directly affecting flight controls, power controls, and flight characteristics, etc.
- 4.5.3 There are limited cases where an engineering design review only includes a drawing review as the sole MOC. A few examples that may use a drawing review as the only MOC are:
- Removable fasteners that meet industry specifications (e.g., MS, AN, etc.) for compliance with 14 CFR § 25.607;
 - Material properties that have statistically determined values in an accepted source such as Metallic Materials Properties Development Standardization Handbook for compliance with § 25.613 (e.g., aluminum 2024-T3, 6061-T4, etc.).
- 4.5.4 In the cases mentioned in 4.4.3, the applicant is still responsible for providing evidence explaining the logic that went into the review of the drawing. The substantiation data presents and explains the inter-relationship of the evidence in a logical order leading from the requirement to the claim.

4.5.5 Certain airworthiness requirements and TSOs expressly require that testing or inspection be used in showing compliance (e.g., 14 CFR Part 25, Subpart B). For those requirements, the use of an engineering drawing review as the sole MOC would not be permitted.

4.6 **Analysis.**

4.6.1 Analysis is an integral part of showing compliance. It encompasses the full range of analytical techniques consisting of quantitative or qualitative assessment to include, but is not limited to, textbook formulas, computer algorithms, computer modeling/simulation, similarity analysis, comparative analysis, electrical load analysis, or system safety assessment means (e.g., functional hazard analysis, fault tree analysis, failure mode and effects analysis, etc.).

4.6.2 The overall evaluation process should consider the structural aspects, functionality, operational capabilities, and limitations. In all cases, the evaluation process is of fundamental importance in meeting the applicable requirements for certification or approval.

4.6.3 The FAA approves the data, not the analytical technique, so the FAA holds no list of acceptable analyses, approved computer codes, or standard formulas. Use of a well-established analysis technique is not enough to guarantee the validity of the result. The applicant is responsible for showing that the data are valid and does not violate the assumptions considered for the design. This is usually applicable to computer modeling/simulation software, but is not limited to such.

4.7 **Testing.**

4.7.1 Engineering Tests – Engineering tests are used to validate various assumptions or when analysis techniques alone would not be sufficient to substantiate the proposed design. Engineering tests are used to demonstrate compliance with a requirement or to collect design approval or component data necessary for showing compliance. Some examples of engineering tests include, but are not limited to, part qualification, equipment qualification tests, system function, iron bird, fatigue, flammability, landing gear drop test, wing, fuselage, empennage tests, ground vibration tests, and electro-magnetic interference tests.

4.7.2 Flight and Ground Tests –This section refers to any ground or flight test performed on the design approval test article that is controlled or evaluated by FAA flight test personnel (or their designees) in support of appropriately authorized official testing. Certification flight tests are used by the FAA to verify the flight test data reported by the applicant or to obtain compliance data for flight testing conducted concurrently with the applicant. These tests evaluate the aircraft's performance, flight characteristics, operational qualities, and equipment operation. They also determine operational limitations, procedures, and pilot information. Certification flight tests are conducted under the Type Inspection Authorization (TIA) and may include flight, and functional and reliability testing. A certification flight test may provide both a compliance showing

for the engineer, as well as a qualitative assessment for the pilot. Data generated from engineering flight tests that are conducted solely by the applicant may be used as part of the compliance showing.

- 4.7.3 The descriptions of flight and ground tests should not be confused with the distinction between test articles that are not conducted under TIA (ground tests that are engineering tests) and those that are conducted under TIA (flight tests, which can be conducted in flight or on the ground). As per FAA Order 8110.4, tests conducted on the product test article that are controlled or evaluated by FAA flight test personnel are TIA flight tests.

4.8 **Inspection.**

- 4.8.1 An engineering compliance inspection is used when necessary to observe, view, or examine a design to show compliance with the applicable certification requirements. Compliance inspections are done for any aspect of designs and installations where compliance cannot be determined through the review of drawings or reports alone. FAA engineering compliance inspections should not be confused with a conformity inspection done by manufacturing inspectors. A conformity inspection determines conformity to engineering drawings, specifications etc. A conformity inspection is a pre-requisite to a compliance inspection.

- 4.8.2 Examples of Compliance Inspections may include but are not limited to:

- Interior compliance inspections
- Control system compliance inspections
- Fire protection compliance inspections
- System routing compliance inspections
- Inspections of Markings/Placards for certain systems
- Wiring compliance inspections
- Zonal safety inspection

4.9 **Not Applicable.**

- 4.9.1 This means the specific regulation is not applicable (i.e., not affected), and a showing of compliance is not necessary. For example:

- § 25.613(b)(2) does not apply if the structure does not have redundant load path structure, or
- § 25.817 does not apply if the aircraft has more than one passenger aisle

- 4.9.2 The FAA does not prescribe a specific set of MOC codes; however, for the purposes of this AC, some of the FAA's bilateral partners have established guidance for numbering MOC for standardization. The FAA accepts use of these codes; however, the associated compliance documents referenced should be consistent with FAA compliance expectations. For example, MC0, compliance statements and MC1, design review are supported by appropriate evidence (e.g., a compliance report) as stated in Section 5.1.

- 4.10 Industry accepted MOC. The FAA has accepted industry agreed MOC codes through the applicant for design or design change approval, such as EASA defined MOC codes. These codes are listed in EASA guidance [Appendix A to AMC 21.A15\(b\), Means of Compliance Codes \(caa.co.uk\)](#), and contain examples of industry accepted recommendations and a brief explanation of their application. Please see an example of these codes in the Table 1 below.

Table 1 Example of Means of Compliance codes used by EASA and accepted by FAA/Industry

Type of compliance	Means of compliance	Associated compliance documents
Engineering evaluation	MC0: (a) compliance statement (b) reference to design data (c) election of means, factors, etc. (d) definitions	(a) Design data (b) Recorded statements
	MC1: design review	(c) Descriptions (d) Drawings
	MC2: calculation/analysis	(e) Substantiation reports
	MC3: safety assessment	(f) Safety analysis
Tests	MC4: laboratory tests	(g) Test programs (h) Test reports (i) Test interpretations
	MC5: ground tests on related design approval(s)	
	MC6: flight tests	
	MC8: simulation	

Type of compliance	Means of compliance	Associated compliance documents
Inspection	MC7: design inspection/audit	(j) Inspection or audit reports
Equipment qualification	MC9: equipment qualification	Note: Equipment qualification is a process that may include all previous MOC at equipment level.

5 PREVIOUSLY FAA-APPROVED DESIGNS.

- 5.1 Over-reliance on previously FAA-approved design data for one type design configuration, product, or design approval may lead to the assumption that the same design data will be compliant when used on a subsequent type design configuration, product, or design approval without further evaluation. Service history has shown that the previously approved design data may not always be exactly applicable for showing compliance for a subsequent design configuration where the design has been altered (such as in the routing of flight controls, software approvals of engine and power control systems, or calibration of throttle and gust lock systems), which may lead to a catastrophic event or inadequate compliance showing. Verify and validate the requirements and design assumptions, subsequently using additional tests, analysis, or compliance inspections as necessary to ensure adequate compliance showings and the safety of the aircraft. It is also important to ensure that incorporation of the previously approved design for subsequent design approvals does not adversely affect other systems, components, or make the aircraft unsafe.
- 5.2 Sections 21.20, 21.21(b), and 21.97 of 14 CFR require applicants to show and certify compliance and submit the type design, test reports, and computations necessary to show that the product (or change to the product) to be certificated meets the applicable airworthiness requirements; aircraft noise, fuel venting, and exhaust emission requirements; and any special conditions prescribed by the FAA. For each affected area, a new showing of compliance is required to explain how the use of the applicant's data is valid and applicable. Compliance reports are the applicant's way of showing compliance. Even if an applicant proposes compliance via engineering design review, the FAA expects the applicant to create and include evidence in the compliance reports and explain the logic of the review of the drawing, or reuse of the data for additional applicability.
- 5.3 The applicant is responsible for accounting for any differences in the design, operations, and regulations if the amendment levels of the regulations are not the same for the two designs.

6 AC FEEDBACK FORM.

For your convenience, the AC Feedback Form is the last page of this AC. Note any deficiencies found, clarifications needed, or suggested improvements regarding the contents of this AC on the Feedback Form.

Daniel J. Elgas
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Advisory Circular Feedback Form

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Subject: _____

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Please mark all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph _____ on page _____.

☐ Recommend paragraph _____ on page _____ be changed as follows:

☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

☐ Other comments:

☐ I would like to discuss the above. Please contact me using the information below.

Submitted by: _____ Date: _____