CHANGE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

ORDER
8110.4C
CHG 4

National Policy

Effective Date:
03/24/2011

SUBJ: Type Certification

1. Purpose. This change transmits revised pages to Order 8110.4c, *Type Certification.* This change is issued to remove procedures related to the issue paper process and the development of Equivalent Levels of Safety (ELOS) memorandums. The revised issue paper procedures are now published in Order 8110.112, *Standardized Procedures for Usage of Issue Papers and Development of Equivalent Levels of Safety Memorandums.* In addition, this change is issued to introduce revised policy related to procedures for non-technical standard order (TSO) function data submitted with an application for TSO authorization (TSOA). Note that this revised policy cancels the policy as published in paragraph 6-9 of change 3 to Order 8110.4c, dated 03/15/2010, and the new policy in paragraph 6-9 of change 4 is now in effect. In addition this change adds a requirement to coordinate with AIR-100 when approvals are sought under the authority of Title 14 of the Code of Federal Regulations (14 CFR) §21.8(d).

2. Who this change affects. Branch levels of the aircraft certification directorates and all certification field offices.

3. Effective Date. The provisions of this change for this directive become effective on the date of signature.

4. Where to Find This Order. You can find this order at MYFAA Employee website: https://employees.faa.gov/tools_resources/orders_notices and on the Regulatory and Guidance Library (RGL) website: http://rgl.faa.gov.

5. Disposition of Transmittal. Retain this transmittal sheet until the directive is canceled by a new directive.

Susan M Cahill

FOR David W. Hempe
Manager, Aircraft Engineering Division, AIR-100
Aircraft Certification Service

PAGE CHANGE CONTROL CHART

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CHAPTER 6. ADDITIONAL INFORMATION ON SELECTED TOPICS

CHAPTER 7. NOISE CERTIFICATION

APPENDIX 1. FORMS AND GUIDANCE FOR CERTIFICATION PROJECTS (14 pages)

(53) Paragraph 5-17 was paragraph 5-12.

(54) Paragraph 5-18 was paragraph 5-13.

(55) Paragraph 5-19 was paragraph 6-4, but has been revised due to issuance of revised FAA Order 8110.41, *Aircraft Certification Service FAA Flight Test Responsibilities, Procedures, and Training.*

(56) Paragraph 5-20 was paragraph 5-14.

(57) Paragraph 6-1 addresses provisional TCs.

(58) Paragraphs 6-2 through 6-6 were paragraphs 6-1 and 6-2.

(59) Paragraph 6-7 addresses multiple airworthiness certification, 14 CFR § 21.187.

(60) Paragraph 6-8 addresses procedures for approving aerial dispensing of liquids.

(61) Chapter 7 was created to capture all 14 CFR part 36 (noise) requirements. These requirements were in paragraph 6-3.

(62) Appendix 1 incorporates numerous revised forms and guidance for establishing certification projects.

(63) Appendix 2, figure 7 incorporates products codes (designations) used on TCDSs for small airplanes, rotorcraft, and engines.

(64) Appendix 5, figure 2 lists current Transport Canada Aircraft Certification Divisions' addresses.

(65) Appendix 12 includes a format and guidance for the preparation of a TSOA letter that includes a non-TSO function.

1-6. DEFINITIONS.

a. Amended TC – an approval for a change to a TC, made by the TC holder. Only the holder of the TC may apply for an amended TC.

b. Certificate Management ACO (CMACO) – the ACO managing the product's TC. The CMACO also manages the continued airworthiness for all products it approves for as long as the products are in service.

c. Certification Plan – the applicant's intended means for showing that a product complies with the applicable regulations.

process. Issue papers are primarily intended to provide an overview of significant issues, a means of determining the status of issues, and a basis for a post-certification summary statement on how issues were resolved. See FAA Order 8110.112, *Standardized Procedures for Usage of Issue Papers and Development of Equivalent Levels of Safety Memorandums,* for detailed information regarding issue paper procedures, issue paper forms and templates, and a sample issue paper.

h. Issues Book. The project manager assembles issue papers and publishes them in the form of an issues book for distribution to the TCB members, project team members, applicant, and the accountable directorate. The issues book may be revised to add new issue papers or update existing papers without holding a formal TCB meeting, provided that the new or updated issue paper can be coordinated through the applicant and TCB.

i. The Project Specific Certification Plan (PSCP) is the primary project management tool for coordinating activities between the FAA and applicants choosing to implement the techniques and guidance described in *The FAA and Industry Guide to Product Certification.* The PSCP combines information from the applicant's certification plan and the FAA's CPP with additional project details to support an effective certification project. It is also the depository for milestones, performance measures, and information unique to the certification project. The FAA and the applicant's certification teams begin developing the PSCP when they have collected the information needed in the applicant's certification plan (discussed in paragraph 2-3d of this order) and the CPP (discussed in paragraph 2-4e of this order). This combined certification team adds additional planning information to meet the objectives outlined in *The FAA and Industry Guide to Product Certification.* Although the PSCP is a plan subject to change, the commitments made by each party are the expectations of the signatories. When developing a PSCP, ensure commitments:

(1) Remain within the authority of the signatories,

(2) Are consistent with FAA regulations or policy,

(3) Do not redefine certificate eligibility (for example, agreeing to a fixed certification date),

(4) Can be met even in circumstances less than ideal, and

(5) Consider obligations made to other projects and applicants.

j. Certification Basis. Early in a TC project, the FAA establishes the certification basis, defining the applicable requirements of 14 CFR for the issuance of the TC. The certification basis identifies the specific 14 CFR parts and amendment levels with which the applicant must show compliance before the issuance of the TC. The certification basis includes the applicable airworthiness standards for the category of the TC to be issued. It also includes the applicable aircraft noise, fuel venting, and exhaust emission requirements contained in 14 CFR. The FAA makes every effort to ensure the certification basis is correct at the beginning of the project and the applicant is advised of all regulatory aspects including operational requirements contained in other subchapters in 14 CFR. The certification basis is established by the FAA and agreed to by the applicant, based on a mutual understanding of the design features of the product to be certificated. Upon agreement of the certification basis, new policy will not be imposed unless

(a) FAA/Applicant Development of the Special Condition. Special conditions are rules of particular applicability that are developed for a particular certification project due to its unique (with respect to the airworthiness standards in the certification basis) design features. Special conditions may be developed using parts taken from other airworthiness standards. For example, a normal category 14 CFR part 23 airplane certification basis may include 14 CFR part 25 airworthiness standards appropriate to the design feature in question. The FAA will publish special conditions for public comment unless the circumstances in 14 CFR § 11.38 apply to the project. The Administrator has delegated authority for issuing special conditions to the accountable directorate or to the Aircraft Engineering Division (AIR-100) for areas of responsibility not assigned to a directorate. The FAA uses the issue paper procedures described in FAA Order 8110.112 to develop the Federal Register Notice requesting public comment. Guidance for the applicant is found in AC 20.166, *Issue Paper Process.*

(b) Urgency of Action. At the time of the preliminary TCB meeting, the ACO sets a date to establish the initial special conditions. These special conditions may be modified and additional ones issued as technical information develops during the type certification project. In certain cases, the project's importance or urgency may require faster handling than typically scheduled. When the ACO believes it has such a case, it should arrange a meeting with the accountable directorate and the applicant. The accountable directorate should be able to expedite the rule making procedure for the special conditions with the input from this meeting.

(c) Procedures for Issuing Special Conditions. An ACO drafts proposed special conditions with reference to the application date for a TC. The applicant, the accountable directorate, and any other interested persons deemed appropriate work together to formulate the proposal. The proposals are forwarded to the accountable directorate with full particulars and justification for each special condition as described in the next paragraph. It is essential that the list of special conditions be complete, as it becomes part of the certification basis and forms an exact record of the rules applicable to the product. When the application is for an amended TC, an STC, or an amended STC, apply the requirements of 14 CFR § 21.101(d). The basis and content of special conditions are generally developed via the issue paper process. In cases where the design feature is covered by a specific objective rule, do not use a special condition as a method or technique to show compliance with the rule. For example, in the 1980s the use of composites for primary structure on 14 CFR part 23 airplanes generated a need for special conditions. In 1993, 14 CFR part 23 was revised to include appropriate standards for using composites as primary structural components. So, composite special conditions are no longer appropriate. If the FAA determines that a special condition is appropriate, and the applicant indicates that they intend to comply voluntarily, then the special condition should still be proposed.

(d) Justification. Complete information from the ACO is needed to cover the general characteristics of the aircraft, or other products, and their unusual design features. When the ACO prepares special conditions, they should include all the necessary details and justification before forwarding them to the accountable directorate. Incomplete information or insufficient justification may delay the processing of the special conditions. The following information should be included:

(4) Equivalent Level of Safety (ELOS) Finding. ELOS findings are made by the accountable directorate when literal compliance with a certification regulation cannot be shown and compensating factors in the design can be shown to provide a level of safety equivalent to that established by the airworthiness standards. An ELOS finding may document a method of compliance that is different from what is stated in the rule, but is judged as acceptable by the FAA.

(a) Use Issue Paper to Develop the ELOS Finding. The FAA and the applicant work together using the issue paper process to develop the proposed ELOS finding for submittal to the directorate. See FAA Order 8110.112 for the procedures to follow. All ELOS findings must be listed on the TCDS or the STC. The TCDS or STC identifies an ELOS memorandum, explaining the basis for the FAA's acceptance of the applicant's proposal that the compensating features provide an ELOS to the literal airworthiness standard.

(b) Develop ELOS Memorandum. Unlike special conditions or exemptions, the ELOS finding is not developed through a public comment process. The ELOS memorandum is a publicly releasable document that is a part of the certification basis. 14 CFR § 21.41 identifies among other items, the certification basis of an aircraft as part of the TC. A certification basis is releasable to the public, in contrast to an issue paper that may contain proprietary information. The issue paper originator or the project manager constructs the ELOS memorandum from the issue paper, ensuring that the memorandum contains the information called for in FAA Order 8110.112. Use the issue paper conclusion to the maximum extent practical and assure that the language in the public document accurately reflects the issue paper conclusion.

NOTE: Ensure all sensitive or proprietary information is kept out of the ELOS memorandum. Refer to paragraph 2-6 k.(1) of this order.

(c) The accountable directorate, in turn, will inform the certification office of its evaluation and concurrence of the ELOS. See appendix C of FAA Order 8110.112 for the standardized ELOS memorandum template. Also, refer to the ELOS section on the RGL for examples of an ELOS memorandum request and acceptance documents.

(d) The accountable directorate staff will assign a reference number to the ELOS memorandum to allow its access from the FAA's RGL electronic database. This ELOS memorandum number should be listed in the TCDS under the Certification Basis section (TCs and ATCs) or in the Limitations and Conditions section of the STC.

(5) Exemptions. An exemption is a grant of relief to an applicant from the requirement of a specified airworthiness standard. A petition for exemption follows the procedures for public comment on rulemaking that are described in 14 CFR part 11. The applicant should submit a petition for exemption to the FAA accountable directorate through the ACO. This permits the directorate to monitor the progress of the development of the certification basis.

d. Coordinate all "aerial dispensing of liquids" certification projects with AIR-110. This includes providing a copy of the CPN, and coordinating issue papers, TCDSs, and STCs, as appropriate, before their issuance.

6-9. EVALUATING NON-TSO FUNCTION(S) INTEGRATED IN A TSO ARTICLE.

a. Background.

(1) FAA Order 8150.1B, Paragraph 17d(3), acknowledges the manufacturer's option to incorporate a non-TSO function in an article that is eligible for TSOA, by stipulating that the safety and performance of the non-TSO function be evaluated under the appropriate airworthiness regulations during installation. In effect, the paragraph instructs the TSOA-issuing ACO to ignore the added non-TSO function, deferring its evaluation to the installation phase of the certification process. However, the design data package referenced under the TSOA contains data that defines the non-TSO function.

(2) With this approach, no oversight is provided by the TSOA-issuing ACO to ensure that the performance of the hosting TSO article is unaffected by the added non-TSO function. Additionally, deferring the evaluation of the non-TSO function until installation is not ideal, since the installer generally does not have the development data, the equipment or the expertise available to the TSO manufacturer to accomplish a thorough equipment performance evaluation, especially when the performance of the non-TSO function must be determined by laboratory simulation or under stressed conditions.

(3) The policy in this paragraph brings greater scrutiny to non-TSO functions integrated in a TSO article by providing guidance to the ACO for the consistent performance evaluation of a non-TSO function at the time of TSO application. As with the TSO article itself, the integrated non-TSO function must have approval for installation in an aircraft. This guidance also allows the ACO to acknowledge the software and hardware design assurance levels and environmental testing accomplished on the non-TSO function, as appropriate, to preclude the need for repeated evaluations for each installation approval. Manufacturers electing to integrate a non-TSO function in a TSO article should comply with the procedures in this paragraph.

b. Policy.

(1) Definition of a Non-TSO Function. A non-TSO function is one that is not covered by a TSO-approved minimum performance standard (MPS), does not support or affect the hosting article's TSO function(s), and could technically be implemented outside of the TSO article. A manufacturer may choose to integrate a non-TSO function into a TSO article to support a foreign airspace requirement; minimize the amount of line replaceable units and interconnected wiring systems in an aircraft installation; address a specific customer/industry need; or for product differentiation. Non-TSO function(s) may be included and accepted on a non-interference basis, as part of a manufacturer's TSO submittal, and a TSOA issued for the article, if the manufacturer demonstrates that it meets all of the following conditions:

(a) The hosting article is eligible for TSOA and meets the applicable TSO performance requirements, per FAA Order 8150.1B, paragraphs 17a(1) and 17a(2);

(b) There is no applicable TSO for the non-TSO function;

(c) The added non-TSO function does not affect or interfere with the hosting TSO article's required MPS or violate any limitations imposed by the hosting TSO; and,

(d) The hosting TSO article's environmental qualification, hardware and software design assurance levels adequately support the non-TSO function.

> **NOTE:** The criticality of the non-TSO function should not exceed that of the hosting TSO article. Conversely, if the integrated non-TSO function criticality is lower than the hosting TSO article, the manufacturer may choose to adopt the higher design assurance levels throughout or to employ proper partitioning techniques.

(2) Project Planning Considerations. Since a TSO-approved MPS does not cover the integrated non-TSO function, the ACO will need adequate time to review the manufacturer's declared performance requirements to 1) verify that the non-TSO function can reasonably be accommodated within the hosting TSO article; and 2) identify any performance or compatibility issues that could affect installation approval. Manufacturers intending to integrate non-TSO functions in a proposed TSO article should plan accordingly and coordinate with their ACO at the earliest opportunity and well in advance of their TSO application, to avoid potential delays to their project.

(3) Manufacturer Data Submittal. Data submitted to the ACO to permit review of the non-TSO function should include, as a minimum, the following:

(a) A clear definition of intended function and any anticipated operational credit that may be sought at the time of installation so that the manufacturer's justification for their proposed hazard classification of failure condition(s) can be evaluated.

(b) The manufacturer's declared performance requirements. Where possible, the manufacturer is encouraged to adopt existing industry-accepted standards, e.g., RTCA, EUROCAE, SAE, or ARINC.

(c) The manufacturer's proposed test procedures to validate the performance requirements for the non-TSO function, including RTCA Document (RTCA/DO)-160 (revision level same as hosting TSO article) environmental test conditions.

(d) Installation instructions, limitations, and maintenance instructions for the non-TSO function(s) as applicable.

(e) The manufacturer's verification that the hosting TSO article's software and hardware design assurance levels, including RTCA/DO-254 complex electronic hardware requirements in accordance with AC 20-152, *RTCA, Inc., Document RTCA/DO-254, Design Assurance Guidance for Airborne Electronic Hardware*, remain appropriate for the non-TSO function.

> **NOTE:** If the non-TSO function includes software components, all RTCA/DO-178 (revision level same as hosting TSO article) software artifacts normally furnished to the ACO or retained by the manufacturer must clearly describe the non-TSO function software components and demonstrate compliance with the requirements of paragraph 6-9 b (1) (c).

(4) ACO Evaluation Criteria. If, following early coordination between the ACO and the manufacturer, it is determined that the non-TSO function is of a simple nature where the performance is easily understandable, ACO review of the manufacturer's declared performance requirements will become part of the data evaluated in a normal TSO application. However, the ACO must require a concurrent type certificate (TC) or supplemental type certificate (STC) project evaluation if it is determined that the added non-TSO function(s):

(a) Is complex and difficult to review and to fully understand without a concurrent installation evaluation;

(b) Has a high degree of system flight deck to pilot interface;

(c) Are of a simple nature individually, but combined in such a way or in sufficient quantities to meet the criteria of 6-9b(4)(a); or

(d) Incorporates new or novel technology.

> **NOTE:** If a TC/STC project is being accomplished at an ACO that is different than the ACO responsible for issuing the TSOA, then both offices should coordinate in the review of manufacturer's declared performance requirements.

(5) Manufacturer Responsibilities. The manufacturer data submitted in accordance with paragraph 6-9 b (3), must stipulate that the non-TSO function is integrated and qualified using the manufacturer's existing configuration control and TSO qualification procedures. The manufacturer must incorporate the non-TSO function(s) data within the required TSO application data provided to the ACO, to include the results of the testing in paragraph 6-9 b (3) (c). The manufacturer must also make the results of any TC/STC installation performance testing that may have been required by paragraph 6-9b(4) available for review by the TSOA-issuing ACO.

(6) Non-TSO Function Acceptance and Installation Data. The TSOA letter issued to the manufacturer should document the TSOAs being granted, including the integrated non-TSO function(s) that were evaluated by the ACO in conjunction with the hosting TSO article. Appendix 12 contains a sample TSOA letter wording when a non-TSO function is included. It is essential to note that the TSO article and any integrated non-TSO function(s) are inseparable at the article level, and should be covered by a common manufacturer's hardware and/or software part number. The TSOA letter conveys design and production approval for the TSO function as well as design acceptance - on a non-interference basis, and production approval for the non-TSO function. This includes ACO acceptance of the manufacturer's statement of conformance for functional performance at the equipment level, hardware and software design assurance, and environmental qualification for the non-TSO function(s). However, because the non-TSO function is not covered under the TSO authority granted by 14 CFR § 21.603(a), the following additional information must be included in the manufacturer's installation manual, component maintenance manual and/or operating manual to support the aircraft installation approval requirements:

(a) A description of the non-TSO function(s), including key performance specifications, as well as software, hardware, environmental, etc., qualification levels.

(b) Interface requirements for the non-TSO function(s) and applicable installation test procedures.

(c) Installation and operating instructions/limitations, including any ICA, for the non-TSO function(s) as applicable.

(d) For non-TSO function(s) that contribute to catastrophic or hazardous failure conditions on the aircraft, the manufacturer should also include a safety analysis of the non-TSO function(s) as implemented in the hosting TSO'd article. The safety analysis should identify the failure modes and effects of the non-TSO function(s) and the expected probability of the failure modes. The analysis should consider exposure times for latent failures, recommended maintenance checks, and the failure rates for the applicable components of the hosting TSO'd article.

> **NOTE:** Integrated non-TSO function(s) contributing to major or lower failure conditions should be evaluated by the manufacturer using the same procedures that are applied to any TSO article contributing to major or lower failure conditions.

(7) Design Change/Modification to a Non-TSO Function. Because the TSO article and any integrated non-TSO function(s) are inseparable, all subsequent design changes to the non-TSO function(s) must be treated identically to design changes made to a TSO function (reference 14 CFR § 21.619 (effective April 11,2011) and Order 8150.1B, paragraph 15). When evaluating a proposed major design change to the TSO article or integrated non-TSO function, the ACO should work with the manufacturer to determine if an applicable TSO has become available for the non-TSO function since its initial approval. If a new TSO is available, the manufacturer must adopt the new TSO MPS for the changed article as required by paragraph 6-9b(2), or elect not to follow the TSO process for the changed article and approve the entire article under the TC/STC process. If a new or updated industry-accepted standard has become available, the manufacturer should be encouraged to re-qualify the non-TSO function to that subsequent standard. Similarly, the FAA's ability to terminate a TSOA applies equally to any issues associated with the integrated non-TSO function.

6-10. APPROVALS UNDER THE AUTHORITY OF 14 CFR § 21.8(d). All approvals under the authority of 14 CFR § 21.8(d) must be coordinated with the Aircraft Engineering Division (AIR-100). The manufacturer should coordinate with AIR-100 early in a proposed project to avoid potential delays in their project.

Appendix 12. Format and Guidance for the Preparation of TSOA Letter that includes a Non-TSO Function

U.S. Department of Transportation
{enter appropriate ACO }
{enter ACO address}
Federal Aviation Administration

{enter date}
In reply refer to: *{enter reference number} {enter name of applicant point of contact (POC)}*
{enter POC's title} {enter name of company} {enter street address} {enter city and mail code}

Dear *{Mr./Mrs./Ms. enter name of applicant POC}:*

This is in reply to your letter of *{enter date of application}* requesting TSOA for your *{insert type of article}*. The statement of conformance to TSO-C*{enter applicable TSO number}* and the submitted data are accepted.

Effective this date, you are authorized to identify the following *{insert type of article}* with the marking requirements defined in 14 CFR § 21.607(d) and in TSO-C*{enter applicable TSO number}*.

{Enter Part/Model} Number *{list each part number, with open brackets to allow for minor changes, model number or if both are necessary use two separate columns}*	*{Enter type of article}* Description *{enter a basic description of equipment, major features that distinguish this part or model number from other part or model numbers in the list}*

Additional non-TSO functions contained in this article are:

Non-TSO Function(s) *{enter name and basic description of each added function}*	Performance Requirements *{List manufacturer's declared performance requirements document, or appropriate section(s) thereof, that refer to the non-TSO function(s).}*

The statement of conformance for functional performance at the equipment level, as well as the hardware and software design assurance, and environmental qualification for the non-TSO function(s) is also accepted on a non-interference basis. The installation instructions, limitations, and maintenance instructions contain the information on the non-TSO function(s) necessary to support installation approval.

Your quality control system, as defined in your Quality Control Manual, *{insert date of manual}*, is considered satisfactory for production of this article at your *{enter location of applicant's manufacturing facility}* facility. The following statement must be furnished to the original owner/installer of each article or multiple articles, if furnished to one source: "The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the standards applicable to the TSO article including the integrated non-TSO function. TSO articles must have separate approval for installation in an aircraft. The article may be installed only if performed under 14 CFR part 43 or the applicable airworthiness requirements." *{A summary statement must be included to describe any approved deviations.}*

Any design change to this TSO article, or the non-TSO function contained within, must be forwarded to this office as outlined in 14 CFR § 21.611 with minor change submittal intervals not to exceed six months. Also, as recipient of this authorization, you are required to report any failure, malfunction, or defect relating to this authorization in accordance with the provisions of 14 CFR § 21.3. This authorization is not transferable to another person or location and is effective until surrendered, withdrawn, or otherwise terminated by the Administrator. Please note that technical data retained by the FAA may be subject to Freedom of Information Act (FOIA) requests. As such, this office will notify you of all such requests pertaining to your data and afford you the opportunity to defend the release of the data.

If you have any questions regarding this authorization, contact *{enter FAA ACO contact and phone number}*

Sincerely, *{insert name of ACO manager} {enter appropriate FAA ACO}* cc: AIR-112; *{insert routing symbol of responsible MIDO/MISO}*

U.S. Department
of Transportation

**Federal Aviation
Administration**

Directive Feedback Information

Please submit any written comments or recommendations for improving this directive or suggest new items or subjects that should be added to it. Also, if you find an error, please tell us about it.

Subject: Order 8110.4C, Change 4

To: Directive Management Officer, AIR-510

(Please check all appropriate line items)

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

☐ Recommend paragraph _____ on page _____ be changed as follows:
(attach separate sheet if necessary)

☐ In a future change to this directive, please include coverage on the following subject:
(briefly describe what you want added)

☐ Other comments:

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

Submitted by: _____ Date: _____

FTS Telephone Number: _____ Routing Symbol: _____

FAA Form 1320-19 (dated 10/98)