TSO 101

Presented to: TSO Workshop

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Federal Aviation Administration

Overview

Technical Standard Order (TSO) Program:

- Origins
- Key terms
- TSO Program
- Roles & Responsibilities
- References
- Questions

Certification Branches (CBs)
(formerly Aircraft Certification Offices/ACOs)

Certificate Management (CM) Sections
(formerly Manufacturing Inspection District Offices/MIDOs)

TSO Key Terminology

- **Article** – a material, part, component, process, or appliance
  - **Appliance** – any instrument, mechanism, equipment, part, apparatus, appurtenance, or accessory (including communications equipment) that is used or intended to be used in operating or controlling an aircraft in flight, is installed in or attached to the aircraft, and is not part of an airframe, engine, or propeller
- **Approved** – unless used with reference to another person, means approved:
  - by the FAA, or
  - by any person to whom the FAA has delegated its authority, or
  - under the provisions of a bilateral agreement between the U.S and a foreign country or jurisdiction
- **TSO design approval** – a process in which the FAA approves an applicant's design for an article (See § 21.8 for approval of articles)
- **TSO production approval** – a process in which the FAA grants permission for the manufacturer to produce articles (See FAA Order 8120.22 and AC 21-43 for production requirements)

❖ Reference FAA Order 8150.1D for a comprehensive list of TSO Program definitions and terms

The Origins – TSO Program

- **Rapid expansion in aviation in 1930's-1940's**
  - Over 30,000 aircraft in operation in 1946
  - Anticipated over 100,000 aircraft in operation by 1950
- **Civil Aeronautics Board (CAB) resources inadequate**
  - Appliance type certificates were used for each article
  - The volume was overwhelming for this pre-FAA organization
- **TSO Program was enacted in 1947**
  - Designed to concentrate CAB resources on aircraft, engines, and propellers (i.e., "products")
  - Enabled FAA to hold manufacturers responsible for meeting the TSO
  - FAA defined the standards for articles and thereby enabled more autonomy for applicants by reducing level of mandatory FAA involvement

What is a Technical Standard Order (TSO)?

Current State

- A **TSO** is a minimum performance standard, defined by the FAA, used to evaluate an article on civil aircraft
  - An **article** can be a material, part, component, process, or appliance
  - A TSO typically references an industry standard (i.e., a voluntary consensus standard by such organizations as SAE, RTCA)
- Each TSO covers a certain type of article intended for use on civil aviation aircraft and provides a baseline standard intended to support compliance with airworthiness or operational requirements

Note: Compliance with a TSO or multiple TSOs cannot ensure the installation of the article will comply with airworthiness requirements. The corresponding airworthiness determination is made during installation [See Advisory Circular (AC) 21-50 for further information]

TSO Program

There are two types of approvals under the TSO Program:

- **TSO Authorization** (TSOA)
- **Letter of TSO Design Approval** (LODA)

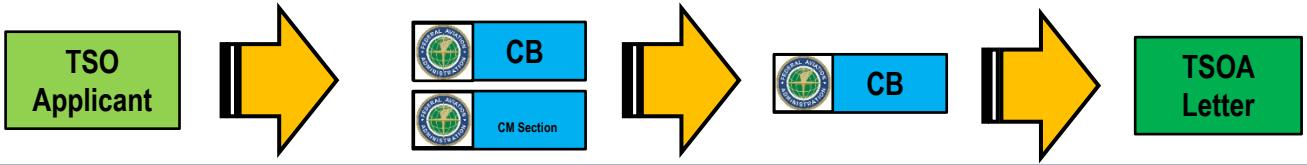
14 CFR 21.601 – 21.621 (Subpart O)

Order 8150.1D

Advisory Circular 21-46A

What is a TSO Authorization (TSOA)?

- A **TSO Authorization** (TSOA) is an FAA design and production approval issued to a U.S. manufacturer for an article that the FAA finds to have met a specific technical standard order.
- A **TSOA** represents official approval granted by the FAA to an applicant to manufacture a material, part, or appliance to meet the minimum performance requirements of a specific technical standard order.
  - A **TSO application** to a Certification Branch (CB) launches two actions:
    1. A **Certification Branch (CB) review** of the TSO application and design data
    2. A Certification Management (CM) Section **review** of the quality system, quality manual, and production facility
    3. After **Certification Branch (CB) review** and **Certification Management (CM) Section** agreement that FAA requirements have been met, the appropriate **Certification Branch (CB) review** issues the **TSOA letter**



Responsibility of TSOA Holder

- A **TSOA holder** accepts responsibility (relative to the TSO standard) for:
  - **Ensuring** that their article conforms to its approved design and meets the TSO(s)
  - **Design** of all parts, including post-approval design changes
  - **Production** of all parts (i.e., all their suppliers are under their quality control system)

§ 21.616 Responsibility of Holder

Each holder of a TSO authorization must -

(a) Amend the document required by § 21.605 as necessary to reflect changes in the organization and provide these amendments to the FAA.

(b) Maintain a quality system in compliance with the data and procedures approved for the TSO authorization;

(c) Ensure that each manufactured article conforms to its approved design, is in a condition for safe operation, and meets the applicable TSO;

(d) Mark the TSO article for which an approval has been issued. Marking must be in accordance with part 45 of this chapter, including any critical parts;

(e) Identify any portion of the TSO article (e.g., sub-assemblies, component parts, or replacement articles) that leave the manufacturer's facility as FAA approved with the manufacturer's part number and name, trademark, symbol, or other FAA approved manufacturer's identification;

(f) Have access to design data necessary to determine conformity and airworthiness for each article produced under the TSO authorization. The manufacturer must retain this data until it no longer manufactures the article. At that time, copies of the data must be sent to the FAA;

(g) Retain its TSO authorization and make it available to the FAA upon request; and

(h) Make available to the FAA information regarding all delegation of authority to suppliers.

What is a Letter of TSO Design Approval (LODA)?

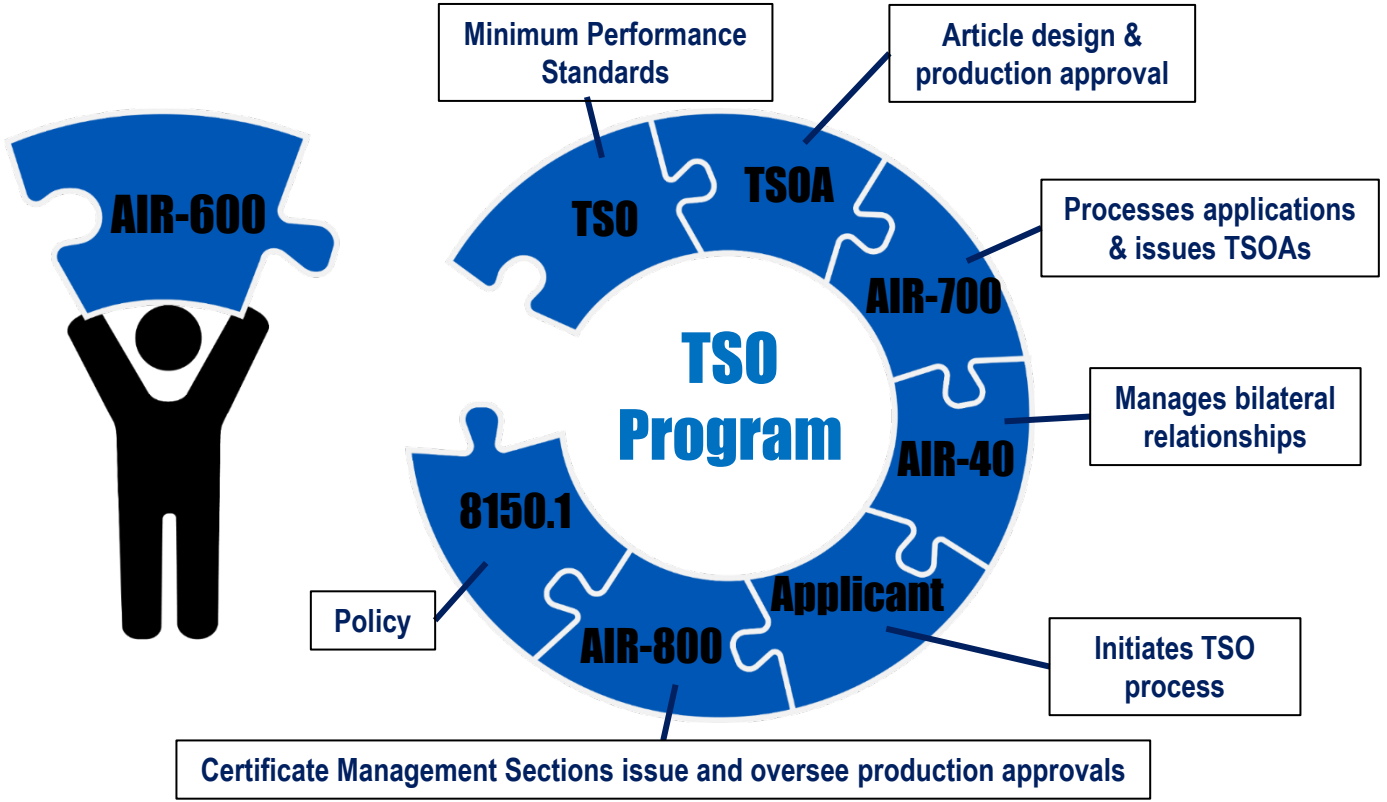
- A **LODA** is a finding by the FAA that a foreign manufacturer's article design meets a specific TSO. A LODA is only a design approval.
- The **foreign Civil Aviation Authority** (CAA) issues and oversees the production approval.
- The request for a LODA is made to the FAA by the foreign CAA on behalf of one of the corresponding country's manufacturers.
- The FAA grants LODAs only to manufacturers in countries with which we have bilateral agreements

Note: *LODAs are no longer issued to manufacturers in Canada, Europe, and Brazil due to acceptance provisions in the corresponding bilateral agreements.*

TSO Approval Process does NOT:

- Guarantee compliance to airworthiness regulations (e.g., parts 23, 25, 27, 29, etc.)
- Approve installation
- Guarantee “interchangeability”
  - Example: TSO-C44b fuel flowmeter cannot be swapped for another TSO-C44b fuel flowmeter without separate compliance finding to airworthiness standards

TSO At-A-Glance



Useful Resources

- Defining a TSO: https://www.faa.gov/aircraft/air_cert/design_approvals/tso
- Defining a TSOA: https://www.faa.gov/aircraft/air_cert/design_approvals/tso/tso_auth
- TSO Regulations and Policies (14 CFR part 21, Order 8150.1, AC 21-46 & more): https://www.faa.gov/aircraft/air_cert/design_approvals/tso/tso_regs
- TSOA Project File Checklist – Standard CERT: https://www.faa.gov/aircraft/air_cert/design_approvals/tso/tso_regs
- Manufacturing under TSOA: https://www.faa.gov/aircraft/air_cert/design_approvals/tso/tso_regs
- Dynamic Regulatory System (DRS) (orders, notices, TSOs, handbooks, bulletins, and manuals): https://drs.faa.gov/browse

Questions?

Future Questions & Feedback:

- **Email box address: TSO-Questions@faa.gov**

Additional Slides

TSO Authorizations (TSOAs)

- **Technical Standard Order (TSO) Authorization:**
  - Combined design and production approval for common type of article (tires, seats, etc.)
  - Design is approved to a TSO Minimum Performance Standard (MPS)
- **Does not include an installation approval**
  - Subsequent installation approval is required through TC, STC, etc.

TSOA Limitations

- No installation approval
- TSOAs are not interchangeable
- Does not guarantee compliance to airworthiness regulations (Parts 23, 25, etc.)
  - Compliance to the applicable airworthiness requirements must be “shown” by the installer

TSOA Benefits

- **Allows reduced FAA involvement during article development process**
  - Applicant provides statement of conformity to TSO
  - Design data generated to show conformance to the TSO may be considered valid
    - Streamlines certification process for TC/STC projects if the TC/STC applicant can show the applicability of the TSO data
- **No commercial limitations for TSOA manufacturer**
  - Installer has the responsibility to obtain separate approval
  - Additional international opportunities due to reciprocal acceptance