TSO Seat Policy

- FAA policy memos for TSO Seats:
  - “Using SAE ARP5526, Aircraft Seat Design Guidance and Clarifications, in Seat Design Approvals”
  - “Classification of Design Changes to TSO-C39b, TSO-C127, and TSO-C127a Articles”
  - “Standard Content and Format for the Installation Instructions and Limitations Required by TSO-C127a”
  - “Type Certificate (TC)/Technical Standard Order (TSO) Seat Issues and Their Resolution”
  - “Technical Standard Order (TSO) Approvals for TSO-C39b, Aircraft Seats and Berths, and TSO-C39c, 9g Transport Airplane Seats Certified by Static Testing”
Use of SAE ARP5526

Using SAE ARP5526, Aircraft Seat Design Guidance and Clarifications, in Seat Design Approvals, 6-26-2003

• Industry team recommended that seat suppliers and seat installers use SAE ARP5526 to the maximum extent possible in design and approval of seats
• Helps to standardize
  • industry recommended design practices
  • means for evaluating compliance of seats to TSO and airworthiness regulations

Use of SAE ARP5526

• Does not impose additional criteria to follow, but allows for acceptable means for meeting TSO and airworthiness requirements
• When TSO applicant chooses to use ARP, must identify in data package how it was used (i.e. which sections)
• TSO holder should ensure that installer knows how ARP was used
Use of SAE ARP5526

- Not all of SAE ARP5526 is applicable
- Table developed to relate each section of ARP5526 to specific sections of:
  - TSO-C39b, TSO-C127, TSO-C127a
  - applicable Part 25 regulations
  - other guidance for seats

Seat TSO Design Changes

Classification of Design Changes to TSO-C39b, TSO-C127, and TSO-C127a Articles, 9-8-2003

- TSO design change definition: any alteration to the data (drawings, specifications, material processes, etc.) or installation limitations necessary to define the article
- Current regs (14 CFR 21.611(b)) major change definition: “any change that is extensive enough to require a substantially complete investigation to determine compliance with the applicable TSO”
  - subject to varying interpretation
Seat TSO Design Changes

• What is “substantially complete investigation” for seat TSOs?
  – Comprehensive evaluation of design data, process specs, and/or material processes required to determine compliance
  – The data package would be significantly different from previous approved seat

• Recognizes that design change classification under the TSO approval and TC approval are different
  – Minor changes to TSO seat can have significant effect on product compliance
  – Example: Small change to seatback angle could interfere with exit row egress

Seat TSO Design Changes

• Examples of major and minor changes to TSO seats
  – Major design changes
    • Significant base material changes to frame
    • Significant structural design changes
    • Rigid frame to energy absorbing frame
    • Significant changes to belt anchor point configuration
  – Minor design changes
    • Seat belt changes
    • Lateral leg spacing
    • Material process changes, ex: forging to machining
    • Cross sectional changes
    • Joint/fitting changes, ex: fastening to welding
    • Seat weight changes
    • Seat cushion changes
Seat TSO Design Changes

- Other changes can be evaluated and resolved with ACO/EASA on a case-by-case basis
- Testing does not automatically classify a TSO design change as “major”
- All changes (major and minor) must be completely and properly substantiated
- Major changes require new type or model designation and application to the latest applicable TSO

Standardized Seat TSO Installation Instructions and Limitations Document

Standard Content and Format for the Installation Instructions and Limitations Required by TSO-C127a, 9-8-2003

- TSO approval ensures that the TSO standard is met but additional installation approval is still required
- Installation has potential to invalidate article’s approval to TSO
- Installation assessment for TSO articles can be relatively simple (eg. life preservers, rafts, seat belts, fire extinguishers, etc.) or more involved (slides, avionics, dynamic seats)
Standardized Seat TSO Installation Instructions and Limitations Document

- For TSO-C127a seats, there is significant potential to install seats in a manner where the seat will no longer meet the MPS of the TSO.
- The likelihood for improper installation can be greatly reduced through the use of clear and complete installation instructions and limitations (IIL).
- An industry group, with FAA participation, developed a standardized format and content for IIL.

Standardized Seat TSO Installation Instructions and Limitations Document

- Not mandatory but recommended by industry to help:
  - Clearly define how installation issues were addressed during the TSO process.
  - Present data/information in a consistent manner to reduce review time.
  - Ensure all data/information needed for installation assessment is available.
  - Eliminate re-investigation of TSO data package.
- A TSO seat installed in accordance with IIL that meets this policy should be assessed for compliance to IIL; the data used to develop the approved IIL should not be re-investigated.
Standardized Seat TSO Installation Instructions and Limitations Document

• Content for IIL
  – Identification
  – Items that Effect the Continued Airworthiness of the Article
  – Installation limitations
  – Installation instructions
  – Data that may be used by the installer in approving an installation

• Format for IIL

5.0 Data That May Be Used By The Installer In Approving An Installation

The following data has been included in the TSO data package and may be used by the installer for the purpose of installation approval:

5.1 Seat Permanent Deformations

The following tables show permanent deformations measured during testing. Measurements are given in millimeters. Reference figures below for location markers and direction.

<table>
<thead>
<tr>
<th>Seat Orientation and Location Markers</th>
<th>Deformations (example)</th>
<th>Target Location</th>
<th>Direction</th>
<th>Pre-Test</th>
<th>Post-Test</th>
<th>Deformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (description)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B (description)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C (etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Seat Issues and Their Resolution

Type Certificate/TSO Seat Issues and Their Resolution, 4-9-2004

- Recognizes that seat certification is shared process between offices (e.g. TSO and aircraft approval)
- Further complicated by seat TSO that allows for data to be collected under TSO approval but evaluated under TC approval (i.e. head path data, lumbar, deformations)
- Seat TSOs are basis for end result - a seat approved in an aircraft - and must be recognized as such

Seat Issues and Their Resolution

- Improving the seat certification process requires:
  - increased ACO-to-ACO communication
  - active ACO management of their TSO holders and applicants
  - resolution of systemic problems
    - Key driver for this policy was to reduce the recurring discrepancies identified during airplane walk-throughs.
Seat Issues and Their Resolution

• Reporting and communication of discrepancies key to identifying systemic problems.
  – Discrepancy is any item/feature on a seat found to be non-compliant to either the TSO, the applicable airworthiness regulations, or both.

• Responsibility for reporting the discrepancy begins with the person who discovers it.

Seat Issues and Their Resolution

• Discrepancies should be resolved at the source:
  – TSO holder responsible for resolving discrepancies to TSO approval and discrepancies to the airworthiness standards that are coextensive with the TSO approval.
  – TC holder responsible for resolving discrepancies to the airworthiness standards
Seat Issues and Their Resolution

• **Resolution dependent on:**
  – when discrepancy is discovered - before or after aircraft type design approval;
  – whether discrepancy is to airworthiness regulations, TSO, or both;
  – whether discrepancy results in non-compliance on previously approved seat installation; and
  – severity of discrepancy - does it result in an unsafe condition?

Revised TSO for 9g Seats

– TSO-C39c issued in February 2004
  • TSO-C39c, “9g TRANSPORT AIRPLANE SEATS CERTIFIED BY STATIC TESTING”, used for all new applications for 9g seats used in Part 25 airplanes
  • TSO-C39b, “AIRCRAFT SEATS AND BERTHS”, still used for all new applications for 9g seats used in Part 23, 27, 29 aircraft
– Because this is unique use of the TSO process, policy was issued to clarify
  • *Technical Standard Order (TSO) Approvals for TSO-C39b, Aircraft Seats and Berths, and TSO-C39c, 9g Transport Airplane Seats Certified by Static Testing*, 3-4-2004
TSO-C39c/TSO-C127a Adjustable Features

- TSO-C39c/TSO-C127a use SAE AS 8049A which requires seat adjustable features to be capable of being stowed without the occupant removing restraint
- Issued to ensure compliance to TSO and level playing field among TSO applicants/holders
- Issued November 2007

TSO Seats and IFE

- In-flight entertainment equipment (IFE) on seats can be approved
  - under the TSO approval*, or
  - under the type certification process

* to a degree
IFE under the TSO Approval

- Seat TSO’s can only approve the IFE for certain attributes (e.g. mass, c.g., means of attachment)
- IFE airworthiness requirements are not approved under the current TSOs (e.g. electrical issues) – must be approved under TC process
- IFE is listed on TSO application drawings and TSO applicant controls IFE supplier,
  - IFE is approved under the TSO approval for mass, c.g., and means of attachment only
  - TSO applicant/holder acts as a supplier to the TC/STC applicant for non-TSO IFE requirements

IFE under the TC Process

- IFE airworthiness requirements are approved under the TC process (e.g. electrical issues)
- IFE is not listed on TSO seat drawings,
- IFE installed in TSO approved seats is a modification to a TSO article and must be appropriately marked
  - Whether the seat is modified after leaving the TSO holder’s system, or
  - If it is integrated at the TSO manufacturing facility
New Policy for IFE in TSO Approved Seats

– Developing new policy for IFE in seats
  • Order developed in 2007 but not yet issued
  • AC drafted and sent out for Public Comment in 2008
  • Expect to issue both in 2009
– Until then…
  • Additional guidance in AC 21-25A, “Approval of Modified Seating Systems Initially Approved Under a Technical Standard Order”

Summary

• Seat TSO policy was developed to help reduce the burden to industry while still maintaining compliance to applicable standards and regulations.

• Per BASA IPAs, applicants and authorities have an obligation to ensure that they are using the latest FAA policy when applying for an FAA TSO approval.
Questions?