Understanding the Structure of a Technical Standard Order (TSO) - II

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We will continue, in this MSC, analyzing the structure of a Technical Standard Order (TSO), with the aim of familiarizing readers with this very important document type, when they wish the approval of possible aeronautical equipment designs by the airworthiness authority (ANAC, FAA). On MSC 41, we interrupt the analysis in the subitem **Environmental Qualification** of the item (3) - **Requirements**. We restart now on **Software Qualification** subitem.

e) **Software Qualification** - The TSO establishes that if the system contains software (and today almost all have, in the aerospace area) it will have to be developed in accordance with the DO-178 (now in version "C"), to ensure a consistent design assurance level with the failures conditions defined in paragraph 3 g. of the TSO.

f) **Electronic Hardware Qualification** - If the equipment is complex[1], ie, not allow for a thorough test to verify functional integrity, then it will have to be developed according to DO-254, to ensure a consistent design assurance level _ _ with the classification of failures conditions defined in paragraph 3g of the TSO.

g) **Deviations** - The FAA (ANAC) supports the use of alternative means to demonstrate compliance with the TSO MPS appropriate, provided that the applicant demonstrates that the media maintain a level of safety equivalent to that provided by the means indicated by TSO . Again, be wise to follow the established media in TSO, avoiding those discussions with the Authority which will surely prolong the approval process equipment.

4) Marking - The TSO establishes that the marking should be permanent and made legibly on the main unit (for example, in the VHF Transceiver) with all the information specified in Subpart O of 21 CFR Part 14, suitable to the TSO in question.

In general, the marking is made on a plate which is then attached to the main unit (see MSC 12).

The TSO also warns that the marking must have permanent effect and be legibly applicable to all subassemblies and components that are easily removable with the following information: anufacturer's name, part number and number of TSO[2]. This information is

Further information about the marking are clearly informed in the respective TSO.

5) Application Data Requirements - The TSO presents to the Applicant a list of data that he must maintain available to the Authority, to support design and production approval. The list is very detailed and clear. Among them, we highlight:

Manuals containing operating instructions and limitations of the equipment; installation instructions (installation manual); part number of the installed software (including review); functional description; part number of the equipment; summary of the tests conducted for the environmental qualification for each subset of equipment; schematic drawings; wiring diagrams and any other documentation required for the installation; list of spare parts by part number (parts catalog), including the manufacturer of the parts, etc.

6) Manufacturer Requirements – The TSO provides that in addition to the above

[1] Today, virtually all avionics equipment are complex.

[2] In addition to this information, the manufacturer inserts in each unit or subset its serial number, important information for the maintenance sector.

information, to be provided to the FAA (ANAC), the manufacturer shall keep available, on its premises, for a possible verification of the FAA, a series of other information, also clearly explained in the TSO. Among them, we highlight:

Specification for the functional qualification for each subset of equipment; calibration procedures; schematic drawings; wiring diagrams; material specification and processes; the results of tests conducted in accordance with paragraph 3d, etc..

7) **Furnished Data Requirements** - the TSO requires that if are provided one or more than one unit of equipment for an user (such as an operator or a repair shop), they will have to be accompanied by a copy or online access of the data contained in certain paragraphs of item 5, considered as the most important by the TSO. These data are clear on the TSO.

   It also requires that to be added any other data that may help for a correct installation, use or for continued compliance with the TSO

   If the equipment contains functions not provided in TSO, it directs the applicant to include a copy of relevant data to the same, required in certain paragraphs of item 5.

8) **How to Get Referenced Documents** - It is the list of all documents referenced in TSO, specifying the originating institution, address, telephone and email.

Well, let's stop here, with the ultimate information that every TSO can be found at www.faa.gov and may be printed without cost to applicants.

We believe that this MSC can somehow be useful, when an applicant has to request a TSO Approval. We believe that it will serve at least as a guide for a preliminary interpretation of a TSO.

Thank you for your patience.

References

(1) **ANAC**: CI 21-009A – Relação das Ordens Técnicas Padrão (OTP). Brazil, 25/05/1.999.

(2) **FAA**: AC 20-110L – Index Aviation Technical Standard Orders. USA, 10/10/2000.

(3) **FAA**: CHANGE Technical Standard Order, Appendix 1: Formal and Guidance for the Preparation of TSO. USA, 23/11/2010.