Department of Transportation
Federal Aviation Administration
Aircraft Certification Service
Washington, DC

TSO-C140

Date: *7/17/02*

Technical Standard Order

Subject: TSO-C140, AEROSPACE FUEL, ENGINE OIL, AND HYDRAULIC FLUID HOSE ASSEMBLIES

1. PURPOSE. This Technical Standard Order (TSO) establishes minimum performance standards (MPS) that hose assemblies, commonly used in aerospace fuel, engine oil, and hydraulic fluid systems, must meet in order to be identified with the TSO-C140 marking.

2. APPLICABILITY. The standards of this TSO apply to any aerospace fuel, engine oil, or hydraulic fluid hose assembly for which an application for a TSO authorization is submitted after [**TSO date**]. Any hose assembly currently approved for manufacture under TSO authorizations TSO-C53a or TSO-C75 may continue to be manufactured under the provisions of the original approval. A major design change to a hose assembly manufactured under the provisions of a TSO-C53a or TSO-C75 authorization or any request for approval to deviate from a performance standard of TSO-C53a or TSO-C75 requires a new authorization under this TSO.

3. REQUIREMENTS. Hose assemblies that will be identified or marked with TSO-C140 must meet the MPS set forth in Sections 1, 3, 4, and 5 of Revision C of the Society of Automotive Engineers, Inc. (SAE) Aerospace Standard Document No. 150 (AS150 REV C), 2001-03, titled "Hose Assembly, Type Classifications of, Basic Performance and Fire Resistance."

a. Functionality. The standards of this TSO apply to all aerospace fuel, engine oil, and hydraulic fluid hose assemblies identified or marked with TSO-C140 and designed for use in any area of an aircraft including areas of high temperatures or potential fire zones.

b. Failure Condition Classification. Omission of a function defined in AS150 REV C may create a failure condition. The applicant must develop each hose assembly to at least the design assurance level commensurate with the failure condition classification of the system in which it is installed.

c. Functional Qualification. Each hose assembly must qualify to the performance standards for the hose assembly as specified in AS150 REV C. This must be verified through continuous sampling of hose assemblies during the manufacturing process. The required performance must be demonstrated by using the test conditions specified in AS150 REV C.

d. Environmental Qualification. A representative sample of the hose assemblies to be certified as "fire resistant" or "fireproof" under this TSO must be subjected to the test conditions specified in Sections 4 and 5 of SAE AS1055 REV D, "Fire Testing of Flexible Hose, Tube Assemblies, Coils, Fittings, and Similar System Components," 1997-06. The environmental test requirements specified in RTCA Document No. DO-160D, "Environmental Conditions and Test Procedures for Airborne Equipment," dated July 29, 1997, have been evaluated and compliance with AS150 REV C will ensure compliance with the provisions of RTCA Document No. DO-160D.

e. Deviation. The FAA has provisions for alternative or equivalent means of compliance with these MPS. Applicants seeking to invoke these provisions must apply for a deviation in accordance with 14 CFR § 21.609.

4. MARKING. Parts manufactured under this TSO must be permanently and legibly marked in accordance with 14 CFR § 21.607(d), however the manufacturer's trademark or Contractor and Government Entity (CAGE) code may be used in lieu of the name and address of the manufacturer. The date of manufacture of the part must be on all hose assemblies and the applicable "Type" code listed in Table 1 of AS150 REV C must be added as an extension to the TSO number (e.g., TSO-C140-Type IIIaB). The marking information required by § 21.607(d) and this paragraph must be applied directly on the hose assembly or on a band permanently affixed to the hose assembly.

5. DATA REQUIREMENTS.

a. Application Data. In accordance with 14 CFR § 21.605(a)(2), the manufacturer must furnish the Federal Aviation Administration (FAA) Aircraft Certification Office (ACO) manager having purview of the manufacturer's facilities, one copy of the following technical data to support the FAA design and production approval:

(1) Operating Instructions and Equipment Limitations. Provide operating instructions and equipment limitations for each type of hose assembly. The instructions and limitations must list the minimum bend radius, maximum twist limitations, maximum operating pressure, maximum operating temperature, minimum flow rate, and fire resistance codes per Section 1.2 of AS150 REV C, as applicable.

(2) Installation Procedures and Limitations. Provide installation procedures that are sufficient to ensure that the hose assembly, when installed in accordance with the installation procedures, continues to meet the requirements of this TSO. The limitations will also be sufficient to identify any unique aspects of the installation and will include the following note:

> NOTE: Satisfactory compliance with the conditions and tests required for TSO approval indicates the hose assembly has met the minimum performance standards specified in this TSO. It is the responsibility of those desiring to install this hose assembly on an aircraft or engine to determine that the installation will not cause the hose assembly to be subjected to conditions in excess of those for which it has been approved.

The hose assembly may only be installed in a manner acceptable to, or approved by, the Administrator.

(3) Material and Process Specifications List. Provide a list of all specifications used in manufacturing and assembling each TSO hose assembly and provide a material description for the hoses and fittings.

(4) Drawings List. Provide a list by part number of all design standard drawings of the components that make up the hose assembly.

(5) Drawings. Provide design standard drawings listed in paragraph 5. a. (4) of this TSO.

(6) Inspection and Evaluation Instructions. Provide instructions for the periodic inspection and evaluation necessary for continued airworthiness once the hose assembly is installed, including recommended inspection intervals and service life considerations.

(7) Quality Control. Provide all functional test specifications that will be used to test each production part to ensure compliance with this TSO, as required by 14 CFR § 21.605(a)(3).

(8) Manufacturer's TSO Qualification Test Report. Provide a copy of completed test reports.

(9) Nameplate Drawing. Provide, if applicable.

(10) Documentation. Provide any other appropriate documentation as specified in AS150 REV C.

b. Manufacturer Data. In addition to the data package required to be furnished directly to the FAA, each manufacturer must have the following technical data available for review by the manager of the ACO having purview of the manufacturer's facilities:

(1) Functional Qualification Specifications. All specifications used to qualify each part's compliance with this TSO.

(2) Equipment Calibration Procedures. All applicable procedures needed to calibrate the equipment used to manufacture components and hose assemblies under this TSO.

(3) Production Records. Production history with applicable test/control records.

(4) Hose Assembly Drawings. All drawings required to manufacture and assemble a hose assembly under this TSO.

c. Furnished Data. The applicant must furnish a copy of the technical data and information specified in paragraphs 5. a. (1) through (6) of this TSO and any other data and information necessary for the proper installation, certification, and use of the hose assembly to each original equipment manufacturer (OEM) using one or more parts manufactured under this

TSO. The OEM is responsible for providing technical data and information to an operator or aircraft owner requesting such data or information.

6. AVAILABILITY OF REFERENCED DOCUMENTS.

a. AS150 REV C, AS1055 REV D, and other SAE documents referenced in those documents may be purchased by mail from the Society of Automotive Engineers Inc., 400 Commonwealth Drive, Warrendale, PA 15096; by phone at (724) 776-4970; or by FAX at (724) 776-0790. Computer users with Internet access may place an order at Internet browser address: http://www.sae.org/products/standards/stdsinfo/standard.htm.

b. Part 21 of Title 14, Code of Federal Regulations may be purchased by mail from the Superintendent of Documents, US Government Printing Office, P.O. Box 371954, Pittsburgh, PA 15250-7954; by phone at (202) 512-1800; or by FAX at (202) 512-2250. Computer users with Internet access may place an order by accessing the Government Printing Office website at http://www.access.gpo.gov/ on the Internet. An electronic copy of part 21 can be viewed on the Internet at http://www.faa.gov/avr/AFS/FARS/far-21.txt.

c. MIL-H documents identified in AS150 REV C may be purchased by mail from the Defense Automated Printing Service, Standardization Document Order Desk, Bldg. 4-Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5094; by phone at (215) 697-2179; or FAX at (215) 697-1462.

/s/David Hempe

David W. Hempe
Manager, Aircraft Engineering Division
Aircraft Certification Service