



# Technical Standard Order

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**Subject: TSO-C150, AIRCRAFT SEALS**

**1. PURPOSE.** This technical standard order (TSO) prescribes property test requirements to obtain the minimum performance of aircraft seals to be identified with the applicable TSO marking.

**2. APPLICABILITY.** The standards of this TSO apply to the types of seals described in appendix 1, Aircraft Seal Property Test Requirements, intended for static and dynamic applications in the manufacture and maintenance of aircraft products. The standards of this TSO are also adaptable to manufacturer's catalog seals and seals of proprietary designs. This TSO shall not be used for standard parts or parts known to be used in critical applications.

**3. REQUIREMENTS.** Aircraft seals that are to be identified with this TSO and that are manufactured on or after the date of this TSO must meet the minimum performance standards specified in the manufacturer's part drawing(s) and applicable part specification(s) submitted with the seal manufacturer's application for TSO authorization.

**a. Test Requirements.** The required performance shall be demonstrated by accomplishing the tests specified for each property in the part drawing and applicable part specification(s) in accordance with the test procedures specified in appendix 1.

**b. Deviations.** Alternative test procedures that produce an equivalent level of safety may be used if specified at the time of TSO application and approved in accordance with 14 CFR §21.609.

## **4. MARKING.**

**a.** In addition to the marking specified in 14 CFR §21.607(d), the seal type, the manufacturer's inspection lot number, and the expected shelf life shall be permanently and legibly marked on each package or container.

**b.** Each individual seal that is manufactured under this TSO must be permanently and legibly marked with at least the name or symbol of the manufacturer, the manufacturer's part

number, and TSO number. When this is not practical, marking may be accomplished in a manner approved by the Administrator.

## **5. DATA REQUIREMENTS.**

**a. In accordance with 14 CFR §21.605 (a) the following data must be furnished to the Aircraft Certification Office (ACO) manager having purview of the manufacturer's facility with each TSO application:**

(1) Part drawing and applicable specifications necessary to define the design and minimum performance for each seal part number.

(2) Manufacturer's TSO Qualification test report in accordance with the test procedures specified in appendix 1.

(3) Seal limitations.

(4) Inspection lot number(s) of qualification parts.

(5) Batch traceability number(s) of the qualification parts material.

**b. In addition to the data required by paragraph 5.a., the following data must be available for review by the ACO manager having purview of the manufacturer's facility:**

(1) Copies of all standards/specifications used in the manufacturer's application for TSO authorization.

(2) Inspection lot number and quantity for each production lot of seals.

(3) Batch traceability number of the material for each lot of seals.

(4) Acceptance test results for each lot of seals.

**c. Data and information that must accompany aircraft seals manufactured under this TSO:**

(1) Inspection lot number(s) and quantity of parts shipped.

(2) A note with the following statement: "The parts contained in this shipment have been manufactured and inspected in accordance with TSO-C150. The conditions and tests required for TSO approval of this article are minimum performance standards. Aircraft seals approved under this TSO are not necessarily interchangeable with other aircraft seals approved under this TSO. Seals of similar dimensional properties may have widely varying performance and material properties. Substitution of seals may only be done if acceptable to or approved by the Administrator."

**6. INSPECTION LOT OF SEALS.** An inspection lot consists of a quantity of seals with one part number produced consecutively from a single batch of material and finished in one continuous process and subsequently submitted for final inspection at one time.

**7. AVAILABILITY OF REFERENCE DOCUMENTS.**

**a.** American Society for Testing and Materials (ASTM) documents may be purchased from: ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

**b.** Federal Aviation Regulations Part 21, Subpart O, may be purchased from: Superintendent of Documents, Government Printing Office, Washington, DC 20402-9325.

**c.** Advisory Circular 20-110 (current revision), “Index of Aviation Technical Standard Orders,” may be obtained from: U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785.

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**APPENDIX 1, AIRCRAFT SEAL PROPERTY TEST REQUIREMENTS****Table 1 - Aircraft Seal Property Test Requirements**

| <b>Seal Type</b>   | <b>Design Properties</b> |                              | <b>Performance Properties</b> |                    |                        |
|--|--------------------------|------------------------------|-------------------------------|--------------------|------------------------|
|  | Material                 | Dimensions/<br>Configuration | Fluid<br>Compatibility        | Heat<br>Resistance | Abrasion<br>Resistance |
| Static,<br>Dynamic<br>Reciprocating,<br>or Dynamic<br>Rotating |                          |                              |                               |                    |                        |
| Pneumatic  | X                        | X                            |                               | X                  | X                      |
| Hydraulic  | X                        | X                            | X                             | X                  |                        |
| Environmenta<br>l  | X                        | X                            |                               | X                  |                        |
| Insulating   | X                        | X                            |                               | X                  | X                      |
| Dampening  | X                        | X                            |                               |                    |                        |
| Anti-<br>Extrusion   | X                        | X                            | X                             |                    | X                      |
| <b>Applicable<br/>Documents</b>                                | Table 2<br>(below)       | Seal Drawing                 | ASTM<br>D471                  | ASTM<br>D395, D573 | ASTM<br>D2228          |

**Table 2 - Aircraft Seal Property Test Requirements for Materials**

| <b>Material Properties</b> | <b>ASTM Test Method</b>   |                   |
|----------------------------|---|-------------------|
|                            | <b>Plastic</b>  | <b>Rubber</b>     |
| Hardness                   | D2240 (“D” Scale)   | D2240 (“A” Scale) |
| Specific Gravity           | D792  | D297              |
| Tensile Strength at Break  | D4894   | D412, D1414       |
| Ultimate Elongation        | D4894, D4745  | D412, D1414       |
| <b>Optional Testing</b>    |   |                   |
| Compression Set            | D695  | D395              |
| Heat Resistance            | D3045, D5510  | D573              |
| Fluid Compatibility        | D543  | D471              |
| Water Absorption           | D570  | N/A               |
| Abrasion Resistance        | Determined by Manufacturer<br>(repeatability must be<br>demonstrated) |                   |

**APPENDIX 1, AIRCRAFT SEAL PROPERTY TEST REQUIREMENTS (continued)**

**AIRCRAFT SEAL PROPERTY TEST REQUIREMENTS**

**1. SEAL PROPERTIES.** Table 1 specifies seal property test requirements for each seal type, as defined on the manufacturers drawing(s) and/or specification(s). The specific material, meeting the material test property requirements of Table 2, and specific design property values for dimensions/configuration form the basis of the seal's design. The specific values for fluid compatibility, heat resistance, and abrasion resistance form the basis of the seal's "minimum performance."

**2. SEAL SERIES TEST SAMPLE.** A seal series (model) of a particular design and type, with a range defined in the seal manufacturer's application for TSO authorization, may be qualified by submitting test data for a sample that is most representative of the design encompassed by the series.

**Applicable ASTM Test Methods.** The revision of the documents (or successor documents) listed below in effect on the date of TSO application must be acceptable to the Administrator and used to establish the procedures for test and evaluation of aircraft seals as indicated in the part drawing and procurement or product specification(s). All additional specifications governing test and evaluation of a seal covered by this TSO must be specified at the time of application for TSO authorization.

|       |   |
|-------|---|
| D297  | Test Methods for Rubber Products - Chemical Analysis  |
| D395  | Test Method for Rubber Property - Compression Set   |
| D412  | Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension |
| D471  | Test Method for Rubber Property - Effect of Liquids   |
| D543  | Test Methods for Resistance of Plastics to Chemical Reagents  |
| D570  | Test Method for Water Absorption of Plastics.   |
| D573  | Test Method for Rubber - Deterioration in an Air Oven   |
| D695  | Test Method for Compressive Properties of Rigid Plastics  |
| D792  | Test Method for Specific Gravity and Density of Plastics by Displacement                            |
| D1414 | Test Methods for Rubber O-Rings   |
| D2228 | Test Method for Rubber Property - Abrasion Resistance (Pico Abrader)                                |

**APPENDIX 1, AIRCRAFT SEAL PROPERTY TEST REQUIREMENTS** (continued)

- D2240 Test Method for Rubber Property - Durometer Hardness
- D3045 Practice for Heat Aging Plastics Without Load
- D4745 Specification for Filled Compounds of Polytetrafluorethylene (PTFE) Molding and Extrusion Materials
- D4894 Specification for Polytetrafluorethylene (PTFE) Granular Molding and Ram Extrusion Materials
- D5510 Practice for Heat Aging of Oxidatively Degradable Plastics