



Number: CTSO-C150a

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Approved by: Xu Chaoqun

## China Civil Aviation Technical Standard Order

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This China Civil Aviation Technical Standard Order (CTSO) is issued according to Part 37 of the China Civil Aviation Regulations (CCAR-37). Each CTSO is a criterion which the concerned aeronautical materials, parts or appliances used on civil aircraft must comply with when it is presented for airworthiness certification.

### Aircraft Seals

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#### **1. Purpose.**

This China Civil Aviation Technical Standard Order (CTSO) is for manufacturers applying for aircraft seals CTSO authorization (CTSOA). This CTSO prescribes the minimum performance standards (MPS) that aircraft seals must first meet for approval and identification with the applicable CTSO marking.

#### **2. Application.**

This CTSO affects new applications submitted after its effective date. Major design changes to article approved under this CTSO will require a new authorization in accordance with section 21.353 of CCAR-21-R4 to apply for new CTSOA.

#### **3. Requirements.**

Aircraft seals that are to be identified with this CTSO and that are

manufactured on or after the date of this CTSO must meet the MPS specified in the documentation test requirements in appendix 1, Aircraft Seal Property Test Requirements.

a. Functionality

This CTSO's standards apply to seals for static and dynamic aircraft applications in pneumatic, hydraulic, environmental, insulating, dampening, and anti-extrusion systems. The CTSO may be used to qualify a manufacturer's catalog seals, seals of proprietary designs, and for seals used in the manufacture and maintenance of aircraft products.

b. Deviations

Alternative test procedures or analytical data that produce an equivalent level of safety may be used if specified at the time of CTSO application and approved in accordance with 21.368(a) in CCAR-21-R4.

**4. Marking.**

a. Mark at least one major component permanently and legibly with all the information in section 21.423(b) of CCAR-21R4. The marking must include the serial number.

b. Mark the following permanently and legibly, with at least the manufacturer's name, subassembly part number, and the CTSO number:

- (1) Each component that is easily removable (without hand tools);
- (2) Each subassembly of the article that applicant determined may be

interchangeable;.

c. If the article includes a deviation per paragraph 3.b of this CTSO, the marking should include a means to indicate a deviation was granted.

## **5. Application Data Requirements.**

The applicant must submit the relevant technical information to the person in charge of the project review to support the design and production approval Submissions include the Declaration of Conformity specified in Article 21.353(1)1 of CCAR-21-R4 and a copy of the following information.

a. A manual(s) containing the following:

(1) Operating instructions and limitations sufficient to describe the article's operational capability.

(2) A description in detail of any deviations.

(3) Installation procedures and limitations sufficient to ensure that the aircraft seals, when installed according to the installation procedures, still meets this CTSO's requirements. Limitations must identify any unique aspects of the installation. The limitations must include a note with the following statement:

**“This article meets the minimum performance and quality control standards required by a CTSO. Installation of this article requires separate approval.”**

b. Instructions covering periodic maintenance and repair, for the continued airworthiness of aircraft seals. Include recommended inspection intervals and service life, as appropriate.

c. Nameplate drawing with the information required by paragraph 4 of this CTSO.

d. Identify functionality, features or performance contained in the article not evaluated under paragraph 3 of this CTSO (that is, non-CTSO functions). Non-CTSO functions are accepted in parallel with the CTSO authorization. For those non-CTSO functions to be accepted, you must declare these functions and include the following information with your CTSO application:

(1) Description of the non-CTSO function(s), such as performance specifications and software, hardware, and environmental qualification levels. Include a statement confirming that the non-CTSO function(s) don't interfere with the article's compliance with the requirements of paragraph 3.

(2) Installation procedures and limitations sufficient to ensure that the non-CTSO function(s) meets the declared functions and performance specification(s) described in paragraph 5.d.(1).

(3) Instructions for continued performance applicable to the non-CTSO function(s) described in paragraph 5.d.(1).

(4) Interface requirements and applicable installation test procedures

to ensure compliance with the performance data defined in paragraph 5.d.(1).

(5) Test plans, analysis and results, as appropriate, to verify that performance of the hosting CTSO article is not affected by the non-CTSO function(s).

(6) (If applicable) Test plans, analysis and results, as appropriate, to verify the function and performance of the non-CTSO function(s) as described in paragraph 5.d.(1).

e. The quality system description required by the section 21.358 of CCAR-21-R4, including functional test specifications. The quality system should ensure that you will detect any change to the approved design that could adversely affect compliance with the CTSO MPS, and reject the article accordingly.

f. Material and process specifications list.

g. List of all drawings and processes (including revision level) that define the article's design.

## **6. Manufacturer Data Requirements.**

Besides the data given directly to the responsible authorities, have the following technical data available for review by the responsible authorities:

a. Functional qualification specifications for qualifying each

production article to ensure compliance with this CTSO.

- b. Dimensional drawings.
- c. Material and process specifications.

## **7. Furnished data Requirements.**

a. If furnishing one or more articles manufactured under this CTSO to one entity (such as an operator or repair station), provide one copy or on-line access to the data in paragraphs 5.a through 5.b of this CTSO. Add any other data needed for the proper installation, certification, use, or for continued compliance with the CTSO, of the aircraft seals.

b. If the article contains declared non-CTSO function(s), include one copy of the data in paragraphs 5.d.(1) through 5.d.(4).

## **8. Availability of Reference Documents.**

American Society for Testing and Materials (ASTM) documents may be purchased from:

ASTM, 100 Barr harbor Drive, West Conshohocken, PA  
19428-2959.

You can also order copies online at [www.astm.org](http://www.astm.org)

## APPENDIX 1. AIRCRAFT SEAL PROPERTY TEST REQUIREMENTS

Seal Type	Table 1 Material Properties							
	Hardness		Specific Gravity		Tensile Strength at Break		Ultimate Elongation	
	Plastic	Rubber	Plastic	Rubber	Plastic	Rubber	Plastic	Rubber
Pneumatic	X	X	X	X	X	X	X	X
Hydraulic	X	X	X	X	X	X	X	X
Environmental	X	X	X	X	X	X	X	X
Insulating	X	X	X	X	X	X	X	X
Dampening	X	X	X	X	X	X	X	X
Anti-Extrusion	X	X	X	X	X	X	X	X
ASTM Test Method								
Applicable Documents	D2240	D2240	D792	D297	D4894	D412	D4894/D4745	D412
	("D" Scale)	("A" Scale)			D638(PEEK)	D1414	D638(PEEK)	D1414

Seal Type	Table 2 Performance Properties									
	Fluid Compatability		Heat Resistance		Water Absorption		Compression Set		Abrasion Resistance	
	Plastic	Rubber	Plastic	Rubber	Plastic	Rubber	Plastic	Rubber	Plastic	Rubber
Pneumatic	O	O	X	X	O	N/A	X	X	Note	X
Hydraulic	X	X	X	X	O	N/A	X	X	O	O
Environmental	O	O	X	X	O	N/A	X	X	O	O
Insulating	O	O	X	X	O	N/A	X	X	Note	X
Dampening	O	O	O	O	O	N/A	X	X	O	O
Anti-Extrusion	X	X	O	O	O	N/A	X	X	Note	X
ASTM Test Method										
Applicable Documents	D543	D471	D3045	D573	D570	D412	D695	D395	Note	D2228
			D5510			D1414				

**Note :** determined by Manufacturer (repeatability must be demonstrated)      X = Required Test      O = Optional Test

Tables 1 and 2 above define the minimum performance standards for qualifying and documenting the performance of aircraft seals.

### 1. SEAL PROPERTIES

The tables specify 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, and specific design property values for dimensions/configuration form the basis of the seal's design. The performance property 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 CTSOA, may be qualified by submitting test data for a sample that is most representative of the design encompassed by the series.

### 3. APPLICABLE ASTM TEST METHODS

The revision of the documents listed below in effect on the date of CTSO application is considered 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 CTSO must be specified at the time of application for CTSOA.

D297 Test Methods for Rubber Products - Chemical Analysis



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- 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
  - D638 Test Method for Tensile Properties of Plastics
  - D695 Test Method for Compressive Properties of Rigid Plastics
  - D792 Test Method for Specific Gravity and Density of Plastics by Displacement
  - D1414 Test Method for Rubber O-Rings
  - D2228 Test Method for Rubber Property - Abrasion Resistance (Pico Abrader)
  - 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