Number：CTSO-2C705
Date of approval：Dec 25, 2020
Approved by：Xu Chaoqun

# China Civil Aviation Technical Standard Order

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.

## Aviation Gasoline

1. Purpose

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

2. Applicability

This CTSO is applicable for new applications since CTSO goes into effect. Major design changes to aviation gasoline approved under this CTSO shall require a new authorization in accordance with CCAR-21.

3. Requirements

a. Composition and process requirements of aviation gasoline

Aviation gasolines consist of blends of refined hydrocarbons derived

from crude petroleum, natural gasoline, or blends, thereof, with synthetic hydrocarbons or aromatic hydrocarbons, or both. Additives include in anti-knock additives, dyes, oxidation inhibitors and electrical conductivity additives, etc. Aviation gasoline is blended by hydrocarbons and additives.

b. Minimum performance requirements

(1) Historically accepted aviation gasoline specifications

The aviation gasolines shall meet the requirements of GB 1787 Aviation Piston Engine Fuels, ASTM D910 Leaded Aviation Gasolines, ASTM D7547 Hydrocarbon Unleaded Aviation Gasoline or DEF STAN 91-090 Gasoline, Aviation, Grades UL91, 100/130 and 100/130 Low Lead, etc. Details see table 1.

Table 1 Corresponding standards of different grades of aviation gasoline

| No. | Aviation gasoline | Standard |
|---|---|---|
| 1 | UL91 | ASTM D7547 or DEF STAN 91-090 or GB 1787 |
| 2 | UL94 | ASTM D7547 |
| 3 | 95 | GB 1787 |
| 4 | 100 | ASTM D910 or DEF STAN 91-090 or GB 1787 |
| 5 | 100LL | ASTM D910 or DEF STAN 91-090 or GB 1787 |
| 6 | 100VLL | ASTM D910 |

(2) Non-accepted aviation gasoline specifications

The non-accepted aviation gasolines, for example, high octane number unleaded aviation gasoline, coal-based aviation gasoline, biological aviation gasoline etc., shall meet the requirements of chapter c (2).

(3) Toluene content is not higher than 24 % (volume %) in aviation gasoline. Xylenes content is not higher than 10 % (volume %) and total aromatic content is not higher than 25 % (volume %) in aviation gasoline.

(4) The types and quantities of additives added to aviation gasoline shall conform to the relevant standards in chapter b (1), otherwise, it shall be approved by CAAC.

c. Other Requirements

In addition to meeting the relevant standards in chapter b (1), historically accepted aviation gasolines shall also meet the performance requirements of table 1 and table 2 in ASTM D7826, such as Fit-For-Purpose properties, fuel compatibility, metallic and non-metallic material compatibility, etc. Testing items are determined by CAAC.

(2) The non-accepted aviation gasolines shall meet all the performance requirements of table 1 and 2 in ASTM D7826, including in basic specification properties, Fit-For-Purpose properties, fuel compatibility, metallic and non-metallic material compatibility, rig test, engine test and flight test, etc. Testing items are determined by CAAC.

d. Testing Laboratory

Testing laboratories shall be approved by CAAC.

e. Deviations

For using alternate or equivalent means of compliance to the criteria in this CTSO, the applicant must show that the product maintains an equivalent level of safety. The applicant must apply for a deviation under the provision of section 21.368(a) in CCAR-21.

4. Marking

The quality certificate and other applicable documents of aviation gasoline shall mark at least the following information:

a. Grade

b. CTSO or CTSOA number;

b. Manufacturer designation and address, manufacture date and batch number.

5. Application Data Requirements

The applicant shall furnish the responsible certification personnel with the related data to support design and production approval. Besides the data required by the China Technical Standard Order Authorization (CTSOA) in CCAR-21, the applicant shall also furnish the following technical data.

a. Standards or specifications involving CTSOA application;

b. Description of feedstock;

c. Description of manufacturing process;

d. Safety Data Sheet (SDS);

e. Other data required by CAAC.

6. Application Note

Due to standards having been filled in TCDS, STC or other design approval documents, aviation gasoline is not essential for installation approval after getting this CTSOA.

7. Referenced Documents

a. ASTM standards are available from:

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

b. GB standards are available from:

Standard Press of China, No.16, North Sanlihe Street, Fuxingmenwai, Beijing. Tel: 010-68523946.

c. DEF-STAN standards are available from:

Defence Standardization, 65 Brown Street, Kentigern House, UK, or

You may also order them online from www.dstan.mod.uk.

# Annex 1

## Aviation Gasoline (Aviation Piston Engine Fuel)

## Quality Certificate (Example)

| | | | | |
|---|---|---|---|---|
| Brand name, grade number and specification: Grade 100LL low leaded Aviation Piston Engine Fuel (GB 1787-2018)<br>CTSO: 2C705<br>CTSOA number:<br>Designation and address of manufacturer: | | | | |
| Product quantity and batch number:<br>Manufacture date: | | | | |
| **Property** | | **Limits** | **Results** | **Test Methods** |
| Motor Octane Number | min | 99.6 | | |
| Performance number | min | 130.0 | | |
| Tetraethyl leadG [a] | | | | |
| Pb/(g/L) | max | 0.56 | | |
| Net heat of combustion [b]/(MJ/kg) | min | 43.5 | | |
| Dye | | Blue | | |
| Density [c](20℃)/(kg/m$^3$) | | report | | |
| Distillation | | | | |
| Initial boiling point/℃ | | report | | |
| Fuel Evaporated | | | | |
| 10% volume percent/℃ | max | 75 | | |
| 40% volume percent /℃ | min | 75 | | |
| 50% volume percent /℃ | max | 105 | | |
| 90% volume percent /℃ | max | 135 | | |
| Final boiling point /℃ | max | 170 | | |
| Sum of 10 % + 50 % evaporated temperatures /℃ | min | 135 | | |
| Residue volume percent /% | max | 1.5 | | |
| Loss volume percent /% | max | 1.5 | | |

| | | | | |
|---|---|---|---|---|
| Vapor pressure [d]/kPa | min | 38.0~49.0 | | |
| Freezing point [e]/℃ | max | -58.0 | | |
| Sulfur [f](mass percent)/% | max | 0.05 | | |
| Oxidation stability (5 h aging) | | | | |
| Potential gum /(mg/100mL) | max | 6 | | |
| Lead precipitate /(mg/100mL) | max | 3 | | |
| Copper strip (100℃, 2h)/class | max | 1 | | |
| Water-soluble acid or alkali | | None | | |
| Mechanical impurities and moisture | | None | | |
| Water reaction | | | | |
| Volume change, mL | max | ±2 | | |

Note:
a. Applies only when an electrical conductivity additive is used; when a customer specifies fuel containing conductivity additive, the following conductivity limits shall apply under the condition at point of use: Minimum 50 pS/m; Maximum 450 pS/m. The supplier shall report the amount of additive added.

| **Conclusion:** | **Tested by:**<br><br>**Reviewed by:** | **Approved by:** |
|---|---|---|

***(The English version is for reference only. In case of any discrepancy or ambiguity of meaning between this English translation and the Chinese version, the latter shall prevail.)***