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National Standard of the People's Republic of China

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Superseding GB 9745—1995

Aircraft Tyres

(ISO 3324 - 1 : 1997 Aircraft tyres and rims—Part 1: Specifications, NEQ)
(Draft for Approval)

Issued on ××××-××-××

Implemented on ××××-××-××

Issued by the General Administration of Quality Supervision,

Foreword

The provisions stated in Chapters 4 and 7 of this Standard are compulsory while the rest of the chapters are recommendatory.

This Standard supersedes GB 9745-1995 *Aircraft Tyres*.

This Standard is not equivalent to the International Standard ISO 3324-1:1997 *Aircraft Tyres-Part 1: Specifications* and the Technical Standard TSO-C62e *Aircraft Tyres* issued by the Federal Aviation Administration.

Major changes in this Standard compared to GB 9745-1995 are:

- modified the applicable scope (Chapter 1 of the 1995 version; Chapter 1 of this version);
- added 1 definition (Chapter 3 of this version);
- added requirement and testing methods on the bead fit pressure of inner tube tyre attached on the skidproof wheel rim (4.5 and 5.5 in this version);
- deleted requirements and test methods on material suitability, resistance of materials to high/low temperature, tyre weight and physical performance (4.2, 4.4, 4.10, 4.14, 5.2 and 5.9 of the 1995 version);
- modified the requirements on tyre static unbalance (item 4.12 in the 1995 version; 4.6 of this version);
- adjusted Chapter 6 to Informative Appendix A (Chapter 6 of the 1995 version; Chapter 6 of this version);
- deleted the provisions on packaging (item 7.2 of the 1995 version);
- modified the tyre markings, storage, and usage (Chapter 7 of the 1995 version; Chapter 7 of this version).

This Standard is proposed by the China Petroleum and Chemical Industry Association.

This Standard falls under the jurisdiction of the National Technical Committee for the Standardization of Aircraft Tyres.

This Standard is subject to the interpretation of National Technical Committee for the Standardization of Aircraft Tyres.

The unit responsible for the drafting of this Standard: Shuguang Rubber Industry Research and Design Institute of China Rubber Group.

Major drafters of this Standard: Deng Haiyan, Zhou Birong, Zhang Hong, Qi Liping.

Previous versions superseded by this Standard:

——GB 9745 - 1988、GB 9745 - 1995。

Aircraft Tyres

1 Scope

This Standard sets the requirements, testing methods, rules for inspection, markings, storage, and usage of aircraft diagonal tyres.

This Standard applies to various new civil aircraft diagonal tyres.

2 Normative References

The provisions of the following documents become provisions of this Standard after being referenced. For dated reference documents, all later amendments (excluding corrigenda) and versions do not apply to this standard; however, the parties to the agreement are encouraged to study whether the latest versions of these documents are applicable. For undated reference documents, the latest versions apply to this Standard.

- GB/T 6326 Tyre Terminologies and Definitions (GB/T 6326-xxxx, ISO 4223-1: 2002 NEQ)
- GB/T 9746 Series of Aircraft Tyres
- GB/T 9747 Testing Method for Dynamic Simulation of Aircraft Tyres
- GB/T 11191 Testing Method for Burst Pressure of Aircraft Tyres
(GB/T 11191-2004, ISO 3324-2: 1998 NEQ)
- GB/T 11192 Testing Method for Static Load Performance of Aircraft Tyres
(GB/T 11192-2004, ISO 3324-2: 1998 NEQ)
- GB/T 11193 Measurement method for Outer Rim Dimensions of Aircraft Tyres
(GB/T 11193-1998, neq ISO 3324-2: 1979)
- GB/T 11194 Testing method for Air-tightness of Tubeless Aircraft Tires
(GB/T 11194-2004, ISO 3324-2: 1998 NEQ)
- GB/T 11195 Testing Method for Bead Fit Pressure of Aircraft Tyres with Inner Tubes
(GB/T 11195-1998, neq ISO 3324-2: 1979)
- GB/T 13652 Surface Quality of Aircraft Tyres
- GB/T 13653 X-ray Inspection Method for Aircraft Tyres
- GB/T 13654 Holographic Inspection Method for Aircraft Tyres
- GB/T 13655 Testing Method for Static Unbalance of Aircraft Tyres
- HG 2195 Usage and Maintenance of Aircraft Tyres

3 Terminologies and Definitions

The following terminologies and definitions as well as those set by GB/T 6326 applies to this Standard.

3.1

Rated inflation pressure

This pertains to the inflation pressure value of tyres, which correspond to the static load radius, under rated loads.

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4. Requirements

4.1 Specifications and dimensions, rated value, and static load radius

4.1.1 The formula for specifications, inflation dimensions for the new tyre, rated load, rated inflation pressure and static load radius must conform to the standards set in GB/T 9746.

For tyres whose specifications are not included in GB/T 9746 or tyres whose tread shoulder dimensions are not stipulated, the maximum tread shoulder dimensions must be determined according to formulas (1) and (2):

$$W_s=0.9W \dots\dots\dots(1)$$

$$H_s=0.9H \dots\dots\dots(2)$$

In the formula:

W_s - the maximum tread shoulder width of the inflated tyre;

W - the maximum width¹ of the inflated tyre;

H_s - the maximum tread shoulder height of the inflated tyre;

H - the maximum height of the inflated tyre

4.1.2 When ordinary aircraft tyres are used in helicopters, their rated load will be determined by the rated load of ordinary aircraft tyres multiplied by 1.50, the corresponding inflation pressure must also be multiplied by 1.50. There is no need to carry out any additional assessment tests.

4.2 Dynamic performances

4.2.1 Low speed tyres must undergo 200 times of landing tests, including 100 times each of low speed landing and high speed landing tests.

4.2.2 High speed tyres must undergo 50 times of rated load take-off tests, 1 overloaded take-off test with 1.5 times of the rated load, 10 times of coastdown tests including 8 rated load coastdown tests and 2 times of coastdown tests with 1.2 times of the rated load.

4.2.3 After completing the tyre tests, the following requirements must be met:

¹ The maximum width includes the raised height of the logo, kerbing rib, and decorative rib etc. on the tyre side but does not include the chine height of the tyre in the frontwheel.

After completing its landing, take-off, and coastdown tests, the tyre must not burst or thrown off; there must be no cracks in the groove pattern of the rubber tyre. In addition, the depth of the crack or breakage of the groove pattern of the reinforced tread must not exceed the tyre's outer cord; the maximum area of any part must not exceed 6.25cm² while its depth must not exceed 75% of the groove pattern of the rubber tyre; the block area in the 2.50 cm²-6.25cm² portion of the tyre must not exceed 3 or 10 places, and the total area must not exceed 25.00 cm² (blocks around the tread marking won't be calculated, unless the block area exceeds 6.25cm²). The groove contains reinforced cords in its base hence the cracks or damages of the cords must not be found in any of the requirements set in Table 1. Tyres with inner tubes that have completed the overloaded take-off test must not burst but may be thrown off; tubeless tyres that have completed the overloaded take-off test must, besides meeting the same requirements as those tyres with inner tubes, cool down to an ambient temperature and adjust its pressure to rated inflation pressure, with the drop in the rate of pressure after 24h not exceeded 10% of the rated inflation pressure.

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Table 1 Permitted scope of cracks and damages for reinforced treads

No.	Name	Number of cord cracks and damages found in the groove pattern	Percentage of the tyre circumference
1	Cord cracks	Cord crack in one groove pattern	30
2	Cord cracks	Total of cord cracks in two or more groove patterns	40
3	Cord damages	Cord damage in one groove pattern	65
4	Cord damages	Total number of cord damages in two or more groove patterns	95
5	Cord cracks and damages	Cord cracks and damages reside one groove pattern	65
6	Cord cracks and damages	Total number of cord cracks and damages in two or more groove patterns	95

4.3 Excess pressure performance

When the tyre is inflated to 4 times its rated pressure and the pressure remains 3s, it must not burst, produce bubbles, delaminated, or have broken steel wires or cords.

4.4 Air tight performance for tubeless tyres

Fix the tyre onto the targeted wheel rim, inflate it with the rated inflation pressure, and place it in room temperature for at least 12h; after this, adjust the pressure to the rated inflation pressure, and place it in room temperature for at least 24h, the drop in the inflation pressure must not exceed 5% of the rated inflation pressure.

4.5 bead fit pressure of tyres with inner tubes attached to the skidproof wheel rim

For tyres with rated inflation pressure less than or equal to 275kPa, the bead fit pressure value must reach 170kPa~280kPa;

For tyres with rated inflation pressure of 275kPa~690kPa, the bead fit pressure value must reach 170kPa until the rated inflation pressure;

For tyres with rated inflation pressure over 690kPa, the bead fit pressure value must reach 350kPa or above, but must not exceed the rated inflation pressure value of the tyre.

4.6 Static unbalance

The maximum static unbalance M of the main tyre must not exceed the calculated value in formula (3):

$$M=0.00383D^2 \dots\dots\dots(3)$$

The maximum unbalance M of auxiliary tyre must not exceed the calculated value in formula (4):

$$M=0.00274D^2 \dots\dots\dots(4)$$

In formulas (3), (4):

M—the set static unbalance value of the tyre, unit: N·cm;

D—the maximum inflated outside diameter of the tyre, unit: cm.

4.7 Surface quality

The surface quality of the tyre must conform to the standards set in GB/T 13652.

4.8 Internal defects

No defects must be found inside the tyre such as air bubbles, delamination, steel wire cracks, broken cords, etc.

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5 Testing Methods

5.1 Specifications & dimensions and static load radius

5.1.1 Tyre dimensions

The outer rim of the inflated tyres must be measured according to the dimension set in GB / T 11193.

5.1.2 Static load radius

The static load radius must be measured according to the standard set in GB/T 11192.

5.2 Dynamic performance

The dynamic performance of the tyres must be tested based on GB/T 9747.

5.3 Excess pressure performance

The excess pressure performance of the tyres must be tested based on GB/T 11191.

5.4 Air-tightness of tubeless tyres

Air-tightness of tubeless tyres must be tested based on the requirements in GB/T 11194.

5.5 Bead fit pressure of tyres with inner tubes attached on the skidproof wheel rim

Bead fit pressure of tyres with inner tubes attached to the skidproof wheel rim must be tested based on the requirements set in GB/T 11195.

5.6 Static unbalance

Static unbalance must be tested based on the requirements set in GB/T 13655.

5.7 Surface quality

Tyres will be checked and measured visually and with instruments such as steel ruler, metallic tape (without radian, accuracy±1.0mm), vernier caliper (accuracy±0.02mm).

5.8 Internal defects

Internal defects must be inspected based on the requirements set in GB/T 13653 or GB/T 13654.

6 Rules for Inspection

Please refer to Appendix A

7 Markings, storage and usage

7.1 Markings

7.1 Air-escape hole

After being retreaded, tubeless tyres and those with inner tubes and with an inflation pressure higher than 686kPa, an air-escape hole must be placed in the tire again if the old one is covered. The new air-escape hole must be marked with a white colour. The depth for tubeless tyres must not reach the layer of air tightness.

7.1.2 Balance

There must be a “balance” marking placed on the tyre. Put a red dot on the lightest portion on the side of the tyres, close to the bead. The said marking must be seen clearly on the original tyre within its storage period and usage.

7.1.3 Other markings

Aside from the air-escape hole and balance marking , there must be at least the presence of the following markings on the side of the tyres, among which, items a) ~ j) are permanent markings:

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- a) specifications;
- b) ply rating (or actual number of layers);
- c) manufacturing date and product serial number;
- d) name of the materials used in the tyre body frame;
- e) tubeless tyres must be marked with the word ‘tubeless’;
- f) fabric reinforced tread shall be marked with “reinforced tread”;
- g) rated speed, rated load and pattern depth of the simulated model;
- h) manufacturer’s name and trademark;
- i) implemented Standard Number;
- j) Accessories No.;
- k) Seal of Inspection.

7.2 Storage and usage

Tyres must be stored and used according to the standards set in HG 2195. The sum of their storage and usage time must not exceed 5 years from the date of manufacture.

Appendix A
(Informative Appendix)
Rules in Inspection

1 Approval of Product Batches

Tyres will be grouped and approved according to specifications and ply ratings. Every 500 or 1000 tyres with the same specifications and ply ratings, which are manufactured within a succeeding date and under similar manufacturing conditions, will make up one batch. However, volume in excess of 500 or 1000 will form another batch.

2 Inspection and Classification

Inspection is divided into out-of-factory inspection and comprehensive inspection. Out-of-factory inspection refers to the various inspections done when products are delivered. Comprehensive inspection means carrying out a complete assessment of the quality of the product, which is to inspect the tyre according to requirements set by this Standard.

3 Comprehensive Inspection

Comprehensive inspection shall be done when one of the following occurs:

- an evaluation of the trial manufacturing process when new products are put in production or when old products are transferred to another factory and produced there;
- when large changes are made in the structure, major raw materials, and techniques after formal production has begun;
- when there is a big discrepancy between the results of the out-of-factory inspection and the previous comprehensive inspection;
- when government quality monitoring institutions require a comprehensive inspection to be carried out.

4 Out-of-factory Inspection

Out-of-factory inspection is composed of 100% inspection and sampling inspection.

4.1 Items for 100% inspection

- a) static unbalance;
- b) surface quality.

4.2 Items for sampling inspection

- a) dimensions of the inflated tyre's outer rim (excluding dimensions of the tyre shoulder);

- b) excess pressure performance;
- c) air-tightness of tubeless tyres attached to the skidproof wheel rim;
- d) bead fit pressure of tyres with inner tubes;
- e) internal defects

5 Sampling Plan

A random sampling method is used to draw samples. This is to ensure the consistency of the samples with the rest of the products. Products that have surface defects but do not affect the test results are allowed to be sampled; however they cannot be named as samples.

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5.1 Comprehensive inspection

Draw 2 tyres from the product batch, 1 tyre undergoes a dynamic performance test while the other tyre undergoes other specified inspections. In case the samples are insufficient to carry out all the inspections, double sampling may be done.

5.2 Out-of-factory inspection

Samples for the inspection of the tyres' internal defects will be drawn from the 5%-10% of each product batch; remove 1 tyre from each product batch for other sampling inspections.

6 Rules for Re-inspection

When substandard products are found during a sampling inspection, a double sampling is allowed for re-inspection. Rules for re-inspection are as follows:

- a) when the air-tightness or inflated outer rim dimension of the retreaded tyre do not fulfil the requirements, two more samples may be randomly drawn for re-inspection in the same product batch. Based on the results, when both of the two samples qualify, this product batch will be judged as having passed the inspection; otherwise, it has failed.
- b) if the retreaded tyres fail to pass the inspection after double sampling and a re-inspection of their internal defects, a 100% inspection shall be carried out for all the products.