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IS 15428 (2004): Retreading of Radial/Cross Ply Tyres for Aircraft [TED 14: Aircraft and Space Vehicles]



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Indian Standard

RETREADING OF RADIAL/CROSS PLY TYRES FOR
AIRCRAFT — SPECIFICATION

ICS 83.160.20

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Aircraft, Space Vehicles, Air Cargo Handling and Aircraft Electrical Equipment Sectional Committee had been approved by the Transport Engineering Divisional Council.

In the preparation of this standard, considerable assistance has been derived from the following:

BS 2M 47 : 1990 Specification for retreading of cross ply tyres for aircraft

MIL-R-7726H Specification for repair and rebuilding of used aircraft pneumatic tyres

FAA advisory circular AC No. 145-4 dated 27.9.1982 on 'Inspection, retread, repair and alterations of aircraft tyres'

This standard is generally aligned with British, European and USA practice.

The approving authority referred in this standard is the Directorate General of Civil Aviation for Civil Aircrafts and Directorate General of Aeronautical Quality Assurance for Defence Aircrafts.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

RETREADING OF RADIAL/CROSS PLY TYRES FOR AIRCRAFT — SPECIFICATION

1 SCOPE

This standard specifies the minimum requirements for the retreading of cross ply aircraft tyres including carcass rejection criteria and repair limits before processing. It also specifies type approval tests, quality assurance requirements and interchangeability limits to be met by the retreaded tyre after processing. Except where otherwise stated, these requirements apply to both tube and tubeless type tyres.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this

standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	Title
3400 (Part 5) : 1986	Methods of tests for vulcanized rubbers: Part 5 Adhesion of rubbers to textile fabrics (<i>second revision</i>)
10992 (Part 1) : 2003/ ISO 3324-1 : 1997	Aircraft tyres and rims: Specifications (<i>first revision</i>)
10992 (Part 2) : 2003/ ISO 3324-2 : 1998	Aircraft tyres and rims: Test methods for tyres (<i>first revision</i>)

3 TERMINOLOGY

For the purpose of this standard the following definitions shall apply (*see Fig. 1*):

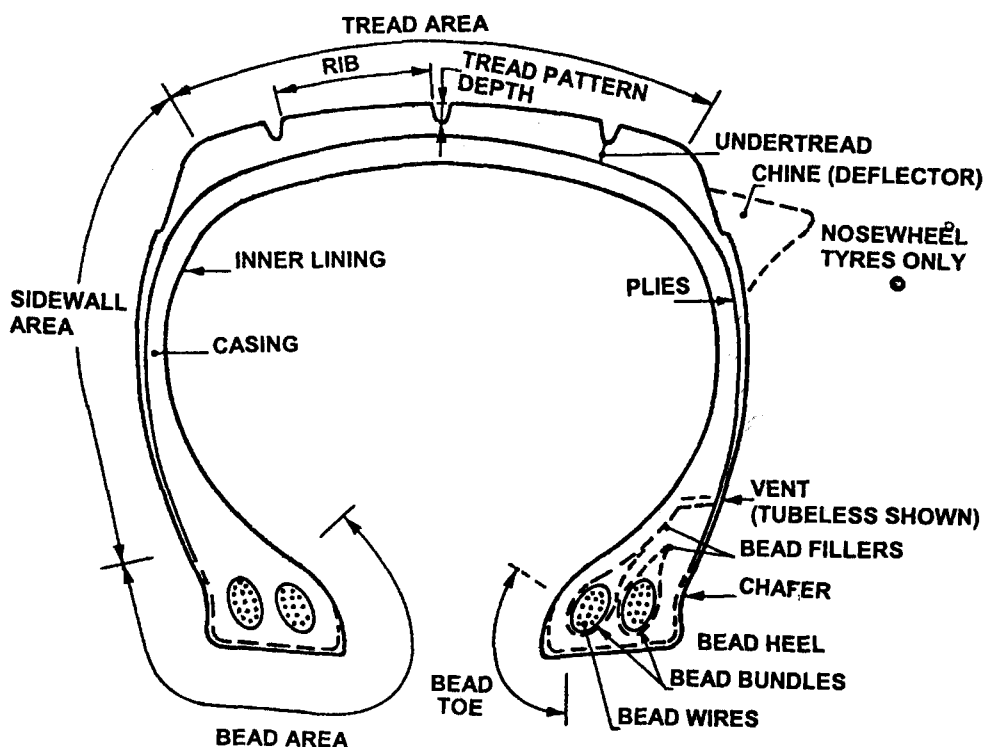


FIG. 1 TYPICAL TYRE SECTION

3.1 Batch — A group of tyres of identical size, type and origin of manufacture and retreaded in one production run.

3.2 Bead — That part of the tyre which is shaped to fit the rim and which maintains the inflated tyre in its correct location on the rim.

3.3 Bead Heel — That part of the bead which fills the angles formed by the junction of the rim flange and rim.

3.4 Bead Toe — The innermost part of the bead opposite to the heel.

3.5 Buffing — The preparation of the tyre surface before the application of new material.

3.6 Casing — Rubber-bonded cord structure of a tyre to contain the inflation pressure.

3.7 Chafer — Material in the bead area to protect against rim chafing

3.8 Chine (Deflector) — A specially profiled circumferential water-deflecting rib located on one or both side walls of the tyre at a predetermined distance below the tread edge.

3.9 Cord — Consists of a number of strands of textile or metallic filament twisted together.

3.10 Crown — Ground-contacting area lying between the shoulders of a tyre.

3.11 Cure — The conditions necessary to provide a given state of vulcanization.

3.12 Inner Lining — A layer of rubber, from bead-toe to bead-toe, on inside of the casing.

3.13 Mould Tread Pattern Depth — The nominal depth of the groove nearest to the centreline of the mould.

3.14 Ply — One layer of rubber bonded cords.

3.15 R-Level — The number of times a carcass has been subjected to a retreading operation (for example, third retread equal to R3).

3.16 Retreading — A process of re-conditioning a worn tyre by one of the following methods.

3.16.1 Bead to Bead Remoulding — A process in which material is removed as necessary and new material, extending from bead area, is applied.

3.16.2 Recapping — A process in which the worn tread material is removed from the worn tread and over the shoulders, and new material is applied.

3.16.3 Top-Capping — A process in which the worn tread material only is removed.

3.17 Rubber — Macro-molecular material which has or can be given, properties of :

- a) at room temperature returning rapidly to the approximate shape from which it has been substantially distorted by a work stress, and
- b) not being easily changed to any other permanent shape by the application of moderate heat and pressure.

3.18 Shoulder — The upper part of the sidewall area just below the tread edge.

3.19 Sidewall Rubber — Layer of rubber to protect the casing in the sidewall area from damage.

3.20 Speed Rating — The maximum ground speed at which a tyre is designed to operate, as follows :

3.20.1 Low Speed Tyre — A tyre designed to operate at maximum ground speeds up to 192 km/h.

3.20.2 High Speed Tyre — A tyre designed to operate at maximum ground speeds above 192 km/h.

3.21 Tread — Outermost band of material to protect the tyre casing.

3.22 Tread Rubber — Shaped strip of unvulcanized rubber compound used for retreading tyre.

3.23 Tread Reinforcement — One or more layer of material fitted within or below the wearable part of the tread.

3.24 Tyre Fitting Lines — The circular moulded lines on the outside of the upper bead area to indicate concentricity of the tyre and wheel when fitting.

3.25 Vent Holes — Holes made in the tyre above the wheel rim area for the purpose of relieving/permeating the entrapped air within the carcass and/or between the tube and carcass of a tubed type tyre.

4 GENERAL REQUIREMENTS

All dimensional and functional requirements of high-speed aircraft tyres are detailed in IS 10992 (Part 1) and IS 10992 (Part 2).

4.1 Interchangeability

A retreaded tyre shall be interchangeable with the equivalent new tyre and shall comply with the following requirements:

- a) Inflated dimensions, before or after dynamic testing (*see 7.2.2*), shall not exceed the grown dimensions of a new tyre specified in IS 10992 (Part 1).
- b) Mass shall not exceed the mass specified by the user commissioning the retreading.
- c) Maximum moment of static imbalance shall be as specified in 4.2.1.
- d) Speed and load rating shall not exceed that marked on the tyre sidewall.

- e) Chine shall not be altered from the original profile.

4.2 Balancing

4.2.1 The tyre shall be balanced. The maximum moment of static imbalance of a tyre M shall be less than the value calculated from the empirical equation :

$$M = (3.87 \times 10^{-5}) D^2$$

where D is the maximum outside diameter in mm.

NOTE — Certain aircraft applications may require a lower M (kg-cm) value, and if so this should be stated in the contract or order.

4.2.2 Residual out of balance shall be corrected by applying a balance patch to the inside of the tyre in the crown area, or by another approved method. The balance patch shall be such that it will not chafe the inner tube, if fitted.

4.2.3 Any balance patch or other materials added to the inside of the tyre shall be securely attached to withstand service operation but shall be fixed such that removal before reprocessing shall not damage the inside surface of the tyre.

5 EXAMINATION OF TYRES/REJECTION CRITERIA BEFORE PROCESSING

All tyres meant for retreading shall be critically examined visually as well as by using suitable NDT techniques for further processing.

5.1 A tyre shall not be used for retreading if it displays any of the following features:

- a) Injuries to the bead or bead area.

NOTE — Repairs may be made if the chafe resistance material only is damaged or loose, or if damage does not extend into the plies of the tyre and if there is no sign of separation in the bead area.
- b) Bead injuries that affect the seal of the bead of tubeless tyres.
- c) Evidence of separation exceeding process specification limits between plies or around the bead wire.
- d) Injuries requiring reinforcement and all injuries requiring sectional repair.
- e) Kinked or broken bead wires.
- f) Weather cracking (Ozone cracking) or radial cracks that penetrate body plies.
- g) Evidence of flex breaks.
- h) Loose, internally damaged or broken cords.
- j) Broken or cut cords in the outside sidewall or shoulder area.
- k) Evidence of blisters or heat damage to the bead seat where reversion, scorching or

rubber flaking has occurred.

- m) Cracked, deteriorated or damaged inner liners which exceed the repairable limits.

NOTES

1 Liner splice damage defects may be repaired if less than 250 mm in length.

2 Other liner defects if less than 50 mm in length may be repaired provided that there are no more than ten of those repairs per tyre and with no more than three repairs in any one quadrant.

- n) Flat spots and skid burns that have penetrated more than one carcass ply.
- p) Saturation with fuel, grease or oil to the point where tread adhesion or tyre integrity is adversely affected.
- q) Sidewalls that have been buffed and veneered more than three times.
- r) Punctures that penetrate through the cord body.

5.2 Defective balance patches shall be removed from all the tyres accepted for retreading under 5.1 and each area of carcass shall be inspected by non-destructive methods to ensure that it is suitable for retreading.

5.3 A tyre that has been run deflated (*see* Note 1) or overloaded (*see* Note 2) shall only be used for retreading at the discretion of the retreader after extensive non-destructive testing has shown the carcass to be acceptable.

NOTES

1 A tyre is considered to have run deflated if it has been used at less than 90 percent of minimum operating pressure.

2 A tyre is considered to have been run overloaded if it is the companion to a deflated tyre on a common axle.

6 PROCESSING AND REPAIRS

A process specification is required to be prepared by the retreader and approved by approving authority. The manufacturer of an aircraft tyre is required to furnish maintenance data that includes maintenance and repair, retreading information, and special NDI techniques, such data may be sufficient basis for development of a process specification, or the retreading agency may develop a process specification which may be qualified by using the inspection and testing techniques contained in this specification. Acceptable methods for developing tyre retread procedures are outlined as follows.

6.1 Preparation for Processing

6.1.1 Buffing

The entire surface to be re-rubberized shall be buffed, care being taken to avoid gouging or burning or loose rubber ends. The contour of the buffed area shall suit the tread profile and the tread mould to be used.

6.1.2 Examination of Carcass

The carcass shall be examined after buffing to ensure that any injuries do not exceed the limits specified in 6.2.

6.1.3 Repair

Before applying the tread rubber and/or reinforcing plies any buffing damage and/or carcass injuries shall be repaired within the limits given in 6.2.

6.2 Tyre Repair Limits

6.2.1 For Tyres Operated Above 192 km/h

- a) *Tread area* — Cuts, cracks or other tread injuries that are 38 mm in length and 6 mm in width or less on the first cord body ply and that do not penetrate more than 50 percent of the actual tyre cord body plies shall be repairable. Any tread injury repaired by skiving or rasping shall not have the final repair greater than 50 mm in length.
- b) *Tread injuries* — Tread injuries shall be repaired if they penetrate a distance equal to 40 percent of actual tyre cord body and if they are 38 mm in length or less on the first cord body, limited to six per tyre and not less than 60° apart along the tyre circumference. Maximum repairs shall be identified on the tyre.
- c) *Sidewall rubber* — Surface defects of any degree whether cracking (ozone cracking), radial and circumferential cracks, cuts and snags shall be repaired provided the injuries do not penetrate into the cord body fabric plies.
- d) *Bead area* — Minor injuries to the bead area shall be repaired provided the plies are not damaged.
- e) *Bead seal* — The bead seal shall not be affected or intersected by impressions or depressions.
- f) *Bead face and bead heel* — The bead face and bead heel areas shall be smooth.
- g) *Bead toe* — The bead toe shall be trimmed so that no edges are exposed above the bead face and so that any bead toe flash remaining does not protrude more than 3 mm from the face contour of the bead. If trimming of the bead toe is necessary, the trimming shall not cut or expose the tyre cord material or more than one layer of chafer material.
- h) *Chafer strip* — Minor injuries in the chafer strip or slight tyre tool injuries in the general bead area are repairable, if they do not extend

into the plies of the tyre and there is no sign of separation in the bead area. Loose or blistered chafer strips shall be repaired or replaced.

- j) *Inner liner* — Inner liner surface damage and defects other than liner splices that are less than 50 mm in length, shall be repairable. A maximum of ten of these repairs are acceptable with no more than three repairs in any one quadrant. Liner splice damage defects shall be repaired, if less than 250 mm in length.
- k) *Exposed cord* — Exposed cord, either in the breaker or carcass ply, shall not exceed 1 percent of the buffed total tread area on one spot or more than 2 percent for the entire tyre. Exposed cord shall not exceed one carcass ply in depth.

6.2.2 For Tyres Operated Below 192 km/h

- a) *Bead injuries* — Repairs shall be made where only the chafe-resistant material is damaged or loose or where minor injuries do not penetrate into more than 25 percent of the tyre plies, up to a maximum of three damaged plies.
- b) *Tread or sidewalls* — Injuries shall be repaired by the spot method. This includes cuts in the tread area that are smaller than 12 mm in length and do not penetrate more than number of plies given in Table 1 into the cord body.

Table 1 Ply Penetration Repair Limits
(Clause 6.2.2)

Sl No.	Number of Plies	Maximum Cut Depth
(1)	(2)	(3)
i)	<8	0
ii)	8 to 16	2 plies
iii)	>16	4 plies

6.3 Retreaded Process

6.3.1 Materials

The materials used in the retread process shall be chemically compatible with the materials used in the original manufacture of the tyre and shall enable the retreaded tyre to comply with 4. The tyre retreader's specification shall include a schedule of quality control for each material and process used which is acceptable to the approving authority.

6.3.2 Re-venting

The tyre shall be re-vented if the original vent holes are determined to be no longer operative or if the tyre

has been subjected to bead-to-bead remoulding. The depth of venting shall be sufficient to penetrate at least the two outermost plies.

6.3.3 Retreader's Specification

The retreading process (recapping, top-capping or bead-to-bead remoulding) and curing shall be carried out in accordance with the individual retreader's specification.

7 MARKING

7.1 General

All markings shall be such that they shall be clearly legible throughout the tread life of the tyre. All previous retread stage markings shall be removed.

7.2 Recap and Top-Cap Operations Only

After processing, the tyre shall bear the following markings in characters not less than 8 mm high on the side bearing the carcass serial number :

- a) Name of retreader and the country in which the tyre was retreaded.
- b) R level, for example, R1, followed by the date of retreading (*see Note under 7.3*).
- c) Speed rating (km/h) in accordance with IS 10992 (Part 1) (*see also 7.4*).
- d) Mould tread pattern depth.
- e) Tread identification code which consists of the letter F followed by the number of reinforcing plies and a capital letter indicating the modification state of the tread, for example, F2A.

7.3 Bead-to-Bead Remould

In addition to the markings specified in 7.2 the following markings shall be included on the sidewall or on the tread edge:

- a) Size designation;
- b) Ply rating and/or load rating;
- c) Original manufacturer's part number;
- d) Name of original manufacturer;
- e) Date of original manufacturer (*see Note*);
- f) Original manufacturer's serial number [to immediately follow (e)]
- g) The word 'TUBELESS' in capital letters, if applicable; and
- h) Certification Authority's approved markings, if applicable.

NOTE — The date of manufacture and retreading shall be indicated such that the first digit represents the last figure of the year, followed by a further three digits indicating the number of days into that year (commonly known as the 'Julian' system). Alternative systems in which the first two digits represent the

month and the second two digits represent the year, or in which the first digit represents the year and the second and third digits represent the week, are applicable.

7.4 Speed Rating

Where the speed rating of the tyre after recapping or top-capping differs from that of the tyre before processing, the original speed rating shall be buffed off the sidewall.

7.5 Additional Markings

7.5.1 Vent Holes

Vent holes shall be indicated with a painted or dyed circular mark, not less than 6 mm in diameter, of a colour other than red.

7.5.2 Balance Markings

The light spot of the tyre shall be marked with a red triangle or dot painted or dyed on the sidewall above the bead on the same side as the serial number marking. Old balance markings shall be removed if not applicable.

7.5.3 The retreaded tyres may also be marked with the Standard Mark.

7.5.3.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence of the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

8 TYPE TEST

8.1 Test Requirements

8.1.1 Type tests given in 8.2 shall be conducted at each manufacturing plant on the following occasions:

- a) whenever the manufacturer of a new size of retread is undertaken; and
- b) before initial fit of a retread to a different aircraft application of equal load rating to that marked on the retread.

8.1.2 Type testing shall be conducted on first life (R1) retreaded tyres manufactured from carcasses that have been previously approved by the approving authority (*see Foreword*) for each aircraft type to which it is intended to fit the retread.

8.1.3 Carcasses used to manufacture R1 retreads for type testing shall have been worn to a minimum of 80 percent in service, and shall have representative maximum damage repairs (*see 6.2.1 or 6.2.2*) naturally or artificially induced.

NOTES

1 Initially, the retreader should successfully type test a retread carried out on a worn first life carcass approved by the approving authority and produced by a specific new tyre manufacturing plant. Approval may then be given for retreads of the same designation and for the same aircraft type produced from approved carcasses from other new tyre manufacturing plants provided that it can be demonstrated that the type test result is equally applicable to such retreads.

2 When the retreading of a tyre of the same size designation for a lesser performance or load rating, an additional type test is not required.

8.2 Performance

8.2.1 Static Tests

NOTE — For these tests two tyres should be used, one tyre for tests in 8.2.1.1 and 8.2.1.2, and the other for the tests in 8.2.1.3 and 8.2.1.4. It is, however, permissible to use one tyre for all the static tests in which case the order of testing should be 8.2.1.1, 8.2.1.3, 8.2.1.2 and 8.2.1.4.

8.2.1.1 Dimensional test

The tyre shall be mounted on its correct rim and inflated to maximum rated pressure. It shall be left for a minimum of 12 h at ambient temperature after which the pressure shall be adjusted to the maximum rated pressure. The dimensions referred to in Annex A shall be measured and recorded on the type test report. The recorded dimensions shall comply with IS 10992 (Part 1).

8.2.1.2 Adhesion test

The adhesion test shall be carried out in accordance with IS 3400 (Part 5) : 1986 for testing the bond strength between the old rubber and the new rubber. The adhesion strength shall be recorded on the type test report (*see* Annex A) and shall be not less than the minimum value specified in the retreader's specification.

8.2.1.3 Air retention (tubeless tyres)

The tyre shall be inflated to the rated inflation pressure and allowed to stand for a minimum of 12 h, after which time the pressure reduction due to tyre growth shall be corrected. The tyre shall then be allowed to stand for a further 24 h at which time the pressure shall be measured and the pressure drop determined. The pressure drop shall not exceed 5 percent of the rated inflation pressure.

8.2.1.4 Burst test (carcass strength)

The tyre shall be hydraulically inflated to twice the minimum rated inflation pressure after which the pressure shall be increased in equal stages of one-tenth (1/10) of the maximum rated inflation pressure, until the tyre bursts. This burst pressure shall be recorded on the type test report (*see* Annex A). The tyre shall

be capable of withstanding without failure a pressure of at least four times the maximum rated inflation pressure for at least 10 s.

NOTE — Burst pressure testing of tubeless tyres may be conducted with an inner tube fitted.

8.2.2 Dynamic Tests

When tested in accordance with IS 10992 (Part 2) the tyre shall remain in sound condition except for normal expected tread wear. Alternatively, dynamic test could be carried out as per Load-Speed-Time (LST) graphs authorized by approving authority.

NOTE — After overload testing in accordance with IS 10992 (Part 2) the tyre retread does not necessarily be in good condition.

8.2.3 Growth Allowance

On completion of dynamic test (*see* 8.2.2) the tyre shall be allowed to cool to ambient temperature. The pressure shall be readjusted to the rated inflation pressure and the dimensions stated in 8.2.1.1 shall be re-measured. The tyre growth shall be calculated which shall not exceed the dimensions given in IS 10992 (Part 1).

8.3 Type Test Report

On completion of each type test the report shown in Annex A shall be forwarded to the Approving Authorities (*see* Foreword).

8.4 Type Approval

After type approval has been granted, the individual retreader's specification shall not be changed without the agreement of the approving authority.

9 R-LEVEL PROOF (ESTABLISHMENT)

9.1 General

To establish the airworthiness of carcasses used in the manufacture of retreaded tyres, each retreader shall proceed in accordance with 9.2 to 9.4 and, if applicable, 9.5. This procedure shall be followed for each proposed increase in R-level.

9.2 Sample

20 in-service tyres shall be selected at the highest retreader level in use distributed among tyre brands, sizes and operators. If the distribution is biased, it shall be in favour of higher load, high-speed tyres.

9.3 Assessment of R-Level (Establishment)

The tyre sample shall be assessed in accordance with Table 2 to determine the R-level.

Table 2 R-Level Proof
(Clause 9.3)

		R-Level (Establishment)											
		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12
Minimum number of tyres required at each R-Level	R1	20	15										
	R2		5	15									
	R3			5	15	5	5						
	R4				5	10		5					
	R5					5	10		5				
	R6						5	10	10	5			
	R7							5		10	5	5	5
	R8								5		10		
	R9									5		10	10
	R10										5		
	R11											5	
	R12												5
	Total		20	20	20	20	20	20	20	20	20	20	20

NOTE — Read down any column to find the number of tyres at each R-level for approval. The preparation of the sample below each R-level should not exceed the proportion of retreader's production at that R-level.

Example — A retreader who has met all the requirements for retreading to R3 should have tested a minimum of 15 R2 tyres and 5 R3 tyres. In order to qualify for retreading at the R4 level, the retreader should test 10 additional R3 tyres and 5 R4 tyres. To go to R5, the retreader should test 5 additional R4 tyres and 5 R5 tyres.

9.4 R-Level Proof Test

9.4.1 Retreading

The tyre sample shall be retreaded in accordance with 5.

9.4.2 Proof Test

The retreaded sample shall be subjected to the proof test given in Annex B.

9.5 Re-testing

If any tyre fails to comply with the appropriate requirements when tested in accordance with Annex B, a second sample of 20 tyres, selected and assessed in accordance with 9.2 and 9.3, shall be re-tested in accordance with 9.4. If any second sample tyre fails to comply with the appropriate requirements, the tyres are below the minimum standards of airworthiness and shall be rejected.

NOTES

1 A retreader who prior to the effective date of this standard was currently retreading aircraft tyres of many sizes, for example, R7 level or higher, may meet the requirements for retreading all tyres up to R7 by testing 5 R4 tyres, 10 R6 tyres and 5 R7 tyres. This 20-tyre sample would be distributed among tyre brands, sizes and operators. If later the retreader wanted to qualify for retreading at R9, the retreader would need to test five additional R7 tyres and five R9 tyres.

2 The retradders may qualify tyres of new design or new size by carrying out the type test described in 8 and the R-level proof test described in 9 on one tyre for level R1. For subsequent increases in R-levels it would be necessary to carry

out R-level proof tests, as tyres of increasing R-level become available, on the following basis :

- For R2, two tyres,
- For R3, three tyres, and
- For R4 and above, one tyre at each R-level.

Tyres retreaded at each R-level may be put into service without test, but a tyre may not progress to the next R-level until the adhesion tests on the number of tyres of the previous R-level have been complied with. Any tyre with defects that do not affect adhesion may be used for the adhesion proof test.

10 QUALITY ASSURANCE

10.1 Quality Control

Each retreader shall operate a system of quality control for each material and process used that is acceptable to the approving authority (*see* Foreword).

10.2 Individual Tyre Quality Checks

10.2.1 Each tyre shall comply with the following requirements:

- Residual imbalance shall not exceed the limits given in 4.1(c).
- Mass shall not exceed the limits given in 4.1(b).
- Marking shall be in accordance with 7.

10.3 Tyre Batch Quality Checks

10.3.1 One sample batch from each production batch shall comply with the following requirements:

- a) Dimensions shall not exceed the limits given in 4.1(a).
- b) Air retention (tubeless tyres) shall be not less than the limits given in 8.2.1.3.

10.3.2 Failure to comply with 10.3.1 shall result in the rejection of the sample tyre, and all remaining tyres in the batch shall be checked in accordance with 10.3.1.

10.4 Rubber Adhesion and Carcass Strength

10.4.1 If the purchaser requires additional tests of

rubber adhesion and carcass strength, this shall be stated in the purchaser's enquiry and/or order.

10.4.2 Sample tyres that undergo the additional tests referred to in 10.4.1 shall comply with the limits given in 8.2.1.2 and 8.2.1.4.

10.4.3 Failure to comply with 10.4.2 shall result in the rejection of all tyres represented by the sample.

10.5 Certificate of Conformity

The retreader shall issue a certificate of conformity for each tyre.

ANNEX A

(Clauses 8.2.1.1, 8.2.1.2, 8.2.4.4 and 8.3)

TYPE TEST REPORT FOR A RETREADED CROSS PLY AIRCRAFT

Retreader and plant location Date

Retreader's specification reference number

Description¹⁾¹⁾ Record information contained in 7.2 and 7.3 as appropriate.

Static Tests	Requirements (see 8)	Type Test Result
Maximum unbalance	.....N.m.	.....N.m.
a) Dimensions and functions		
Outside diameter, <i>Max</i>	.....mm	.....mm
Outside diameter, <i>Min</i>	.....mm	
Overall width, <i>Max</i>	.....mm	
Overall width, <i>Min</i>	.....mm	.....mm
Shoulder diameter, <i>Max</i>	.....mm	.....mm
Shoulder width, <i>Max</i>	.....mm	.....mm
Mass, <i>Max</i>	.....kg	.....kg
b) Air retention (tubeless only)%%
c) Adhesion strength	.....N/mm width	.....N/mm width
d) Carcass strength and burst pressure	.....kPa	.....kPa
e) Dynamic tests (based on aircraft manufacturer's data)		
Data reference	Test report ref.	
High speed tests		
No. of cycles		
f) Dimensional check of tyre after dynamic tests		
Outside diameter, <i>Max</i>	.....mm	.....mm
Outside diameter, <i>Min</i>	.....mm	
Overall width, <i>Max</i>	.....mm	.....mm
Overall width, <i>Min</i>	.....mm	
Shoulder diameter, <i>Max</i>	.....mm	.....mm
Shoulder width, <i>Max</i>	.....mm	.....mm
g) Report of tyre condition		

ANNEX B

(Clauses 9.4.2 and 9.5)

R-LEVEL PROOF TEST

B-1 BACKGROUND

B-1.1 The wide variation in tyre operating environments which affects total carcass life and serviceability, makes it inadvisable to prescribe arbitrarily the maximum number of times a tyre should be retreaded.

B-1.2 Studies have disclosed that due to the complexity of aircraft tyres, the separation propagation mechanism is critically influenced by the overall structural strength and structural uniformity of the carcass. Small separations in a weak carcass may propagate very quickly while the same separation in a very strong carcass may propagate very slowly and go through many R-levels before it will lead to a terminal failure. Accordingly, the number of times a tyre can be retreaded can only be controlled by a thorough inspection of the carcass using the non-destructive methods for each area of the carcass being inspected.

B-2 PROCEDURE

B-2.1 Visual Inspection

Inspect each tyre of the sample visually for compliance with 5.1 to 5.4.

B-2.2 Air Needle Inspection

Subject each tyre to an air needle inspection of the casing to expose any ply separation or defects in the inner liner.

B-2.3 Cross-section Examination

A cross-section from each tyre in the sample shall be cut and examined visually for ply or tread separation, voids or other defects that would render the tyre unsuitable for service.

B-2.4 Tread Adhesion Test

Cut or stamp 3 samples from the centre of the tread at equidistant (about 120° apart) places around each of

the sample tyres. The specimen shall be tested for tread adhesion in accordance with IS 3400 (Part 5) or an equivalent test at the retread buff line. The results from the three specimens shall be averaged and :

- a) for the tyre with the lowest adhesion value of the 20 tyres the adhesion shall be not less than 134 N,
- b) for the tyre with the second lowest adhesion value of the 20 tyres the adhesion shall be not less than 148 N,
- c) for the tyre with the third lowest adhesion value of the 20 tyres the adhesion shall be not less than 161 N, and
- d) for the tyre with the fourth lowest adhesion value of the 20 tyres the adhesion shall be not less than 175 N.

B-2.5 Ply Adhesion

Specimens taken in accordance with B.2.4 shall be tested for ply adhesion in accordance with IS 3400 (Part 5) or an equivalent test between the third and fourth body plies from the top. The results from the three specimens from each tyre shall be averaged and:

- a) for the tyre with the lowest adhesion value of the 20 tyres the adhesion shall be not less than 90 N,
- b) for the tyre with the second lowest adhesion value of the 20 tyres the adhesion shall be not less than 103 N,
- c) for the tyre with the third lowest adhesion value of the 20 tyres the adhesion shall be not less than 116 N, and
- d) for the tyre with the fourth lowest adhesion value of the 20 tyres the adhesion shall be not less than 130 N.

ANNEX C

(Foreword)

COMMITTEE COMPOSITION

Aircraft, Space Vehicles, Air Cargo Handling and Aircraft Electrical Equipment
Sectional Committee, TED 14

<i>Organization</i>	<i>Representative(s)</i>
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SHRI J. M. KHANNA
Joint Director (TED), BIS

Tyres and Associated Accessories for Aircrafts Subcommittee, TED 14:5

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