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400 COMMONWEALTH DRIVE WARRENDALE PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 3792

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Revised

TAPE, LOW MODULUS ARAMID

1. SCOPE:

1.1 Form: This specification covers low-modulus aramid in the form of tape.

1.2 Application: Primarily for use in construction of parachutes.

1.3 Classification: Low-modulus aramid tape shall be as specified in the applicable detail specification, wherein width and breaking strength are defined. An example is shown in 8.1. The tape covered by each detail specification appears as part of the title.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D123 - Definition of Terms Relating to Textiles
ASTM D737 - Air Permeability of Textile Fabrics
ASTM D1682 - Breaking Load and Elongation of Textile Fabrics
ASTM D1910 - Construction Characteristics of Woven Fabrics

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120 except as specified in 2.3.4.

2.3.1 Federal Standards:

FED-STD-4 - Glossary of Fabric Imperfections
FED-STD-191 - Textile Test Methods
FED-STD-595 - Color

2.3.2 Military Specifications:

MIL-W-43334 - Webbing and Tape, Textile, Packaging and Packing of

2.3.3 Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

2.3.4 Other Publications: Available from Federal Trade Commission, Washington, DC 20580.

Rules and Regulations Under the Textile Fiber Products Identification Act

3. TECHNICAL REQUIREMENTS:

3.1 Detail Specifications: The requirements for a specific tape shall consist of all the requirements specified herein in addition to the requirements specified in the applicable detail specification. In case of conflict between the requirements of this basic specification and an applicable detail specification, the requirements of the detail specification shall govern.

3.2 Material: The tape shall be woven from low-modulus aramid fibers which shall not begin to char at a temperature lower than 355°C (670°F), determined in accordance with FED-STD-191, Method 1534. The yarn shall be of the filament count, denier, twist, and color and the weave shall be as specified in the applicable detail specification.

3.3 Properties of Yarn: Shall be as specified in the applicable detail specification, determined in accordance with the following test methods:

Filament Count	Visual
Denier	4.5.1
Ply	Visual
Twist	FED-STD-191, Method 4054
Carbonization (See 3.3.1)	4.5.2

3.3.1 Carbonization: The yarn manufacturer's statement of conformance may be used in lieu of actual test; however, if testing is performed after weaving, the sample for test shall be obtained by unraveling the woven tape.

3.4 Properties of Tape: Shall be as specified in the applicable detail specification, determined in accordance with 4.5.

3.5 Quality: Tape, as received by purchaser, shall be clean, evenly woven, and free from foreign material and from imperfections detrimental to usage of the tape.

3.5.1 Imperfections: Acceptability of each lot of tape shall be based on defects defined in FED-STD-4 and as specified in Table I, herein.

3.5.2 Yard-by-Yard Examination: The required length of each spool shall be inspected and visual defects classified as listed in Table I. The defects found shall be counted regardless of their proximity to each other, except where two or more defects represent a single local condition of the tape, in which case only the more serious defect shall be counted. A continuous defect shall be counted as one defect for each warpwise yard (metre), or fraction thereof, in which it occurs. The acceptable quality level (AQL) shall be 0.40 major defects and 1.50 total defects per 100 yd (90 m). The lot size shall be expressed in units of 1 linear yd (0.9 m) each. An approximately equal number of yards (metres) shall be examined from each spool selected. The number of spools from which the sample is to be selected shall be in accordance with Table II. The terms "clearly noticeable" and "noticeable" shall be interpreted to mean visible at normal inspection distance (approximately 3 ft or 1 m).

TABLE I

CLASSIFICATION OF DEFECTS

Defect	Description	Classification
Abrasion marks	Resulting in rupture of yarns or in nap sufficient to obscure the identity of any yarn exceeding 10% of width or 1 in. (25 mm) in length.	Major
Broken or missing end	2 or more regardless of length or a single end exceeding 6 in. (150 mm) in length.	Major
	Single end from 0.25 - 6.0 in. (6 - 150 mm), inclusive.	Minor
Broken or missing pick	2 or more regardless of extent.	Major

TABLE I (Continued)

CLASSIFICATION OF DEFECTS

Defect	Description	Classification
Coarse or light filling bar	Resulting in noticeable difference in stiffness or thickness of tape and extending more than 0.25 in. (6 mm) in the length direction.	Major
	Resulting in noticeable difference in stiffness or thickness of tape and extending 0.25 in. (6 mm) or less in length direction.	Minor
Cut, hole, or tear	Any cut, hole, or tear.	Major
Drop ply	Clearly noticeable on more than 2 ends within same length and extending over 9 linear in. (225 linear mm) or more.	Major
	Clearly noticeable on 1 or 2 ends within same length and extending over 9 linear in. (225 linear mm) or more.	Minor
Edges	Frayed, slack, or otherwise poorly constructed and exceeding 0.25 in. (6 mm) in length.	Major
Fine or light filling bar, light place	Clearly noticeable.	Major
Floats or skips	Multiple, 0.5 in. (12 mm) or more in combined warp and filling direction, or single float or skip over more than 1 in. (25 mm).	Major
	Multiple, less than 0.5 in. (12 mm) in combined warp and filling direction, or single float or skip over 0.5 in. (12 mm), but not exceeding 1 in. (25 mm) if in warp, or more than 0.25 in. (6 mm) of the width but not exceeding 1 in. (25 mm) if in the filling.	Minor
Hitchback crack	Clearly noticeable opening between adjoining picks, or warpwise tension area over part of the width resulting in noticeable light or heavy places.	Minor

TABLE I (Continued)

CLASSIFICATION OF DEFECTS

Defect	Description	Classification
Jerked-in filling, slough-off, slug	More than twice the thickness of the normal yarn.	Minor
Kinks	More than 3 kinks in any 9 linear in. (225 linear mm).	Major
Knots	More than 2 knots in any 9 linear in. (225 mm).	Major
	Single knot with untrimmed ends extending more than 0.06 in. (1.5 mm) from surface of tape.	Minor
Mispick, double pick	2 or more across the full width.	Major
	Single across the full width.	Minor
Slack end	Two or more in the same length, jerked-in between picks, or forming clearly noticeable loops on the surface of tape.	Major
	Single jerked-in between picks or forming clearly noticeable loops on surface of tape.	Minor
Slub (slug) or gout	More than twice the thickness of the yarn (or ply, if plied).	Minor
Smash	Any smash.	Major
Spot, stain, or streak	Any clearly noticeable dirt, rust, grease, oil spot, stain, or streak.	Minor
Tight end	Clearly noticeable.	Major
Tight pick or tight filling	Resulting in rolling of tape.	Major
Twist or distortion	Twisted or distorted. Will not lay flat upon application of manual pressure.	Minor
Weak, soft, or tender spot	Any weak, soft, or tender spot.	Major
Width	Beyond specified tolerance.	Minor
Wrong draw	Extending for more than 9 in. (225 mm).	Minor

3.5.3 Overall Examination: Each defect listed below shall be counted no more than once in each spool examined. The sample unit for this examination shall be one spool. The sample size and acceptance number shall be as shown in Table II:

Defects
Objectionable odor
Overall uncleanliness
Uneven weaving throughout

3.6 Sizes and Tolerances: Shall be as specified in the applicable detail specification.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the tape shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.6. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the tape conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification and the applicable detail specification are classified as acceptance tests and as preproduction tests and shall be performed prior to or on the initial shipment of tape to a purchaser, on each lot, when a change in material or processing, or both, requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.1 For direct U.S. Military procurement, substantiating test data, and, when requested, preproduction test tape shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows:

4.3.1 For Acceptance Tests: Each lot of tape shall be visually examined as required for quality (3.5) and sampled at random for all other tests; the number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than 3, taken from 3 linear yd (2.7 linear m) of tape.

4.3.1.1 Yarn Tests: Prior to weaving the tape, the yarn shall be sampled as specified below, using 1 cone, 1 tube, or 1 spool as the sample unit. The lot shall be unacceptable if one or more units fail to meet any requirement specified.

Lot Size		Number of Sample Units
Yards	Metres	
Up to 800, incl	Up to 730, incl	2
Over 800 to 10,000, incl	Over 730 to 9,140, incl	3
Over 10,000	Over 9,140	5

4.3.1.2 Yard-by-Yard Examination of Tape: The unit of tape for this examination shall be 1 linear yd (0.9 linear m). The sample size shall be in accordance with Inspection Level III of MIL-STD-105.

4.3.1.3 Overall Examination: The sample unit for this examination shall be one spool. The sample size and acceptance number shall be as shown in Table II. If a lot contains fewer than 5 spools, each spool in the lot shall be examined.

TABLE II

SAMPLING FOR OVERALL EXAMINATION

Lot Size		Sample Size, Rolls	Maximum Number of Defects Accepted in Sample
Yards	Metres		
Up to 1,200, incl	Up to 1,100, incl	5	0
Over 1,200 to 3,200, incl	Over 1,100 to 2,900, incl	7	0
Over 3,200 to 10,000, incl	Over 2,900 to 9,100, incl	10	0
Over 10,000 to 35,000, incl	Over 9,100 to 32,000, incl	15	0
Over 35,000 to 150,000, incl	Over 32,000 to 137,000, incl	25	1
Over 150,000	Over 137,000	35	1

4.3.1.4 Property Examination: The sample unit shall be not less than 8 linear yd (7.2 linear m). The values specified apply to the average of the determinations made on a sample unit. The sample size shall be as specified in Table II. The lot shall be unacceptable if one or more samples fail to meet any requirement specified.

4.3.1.5 A lot shall be all tape of a single size and configuration produced in a single run under the same fixed conditions and presented for vendor's inspection at one time. For mechanical property testing, an inspection lot shall not exceed 5000 yd (4500 m). A lot may be packaged in small quantities under a basic lot approval provided the lot identification is maintained.

4.3.1.6 When a statistical sampling plan and acceptance quality level (AQL) in accordance with MIL-STD-105 other than as specified herein has been agreed upon by purchaser and vendor for testing other than quality (3.5), sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6.1 shall state that such plan was used.

4.4 Approval:

4.4.1 Sample tape shall be approved by purchaser before tape for production use is supplied, unless such approval be waived by purchaser. Results of tests on production tape shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production tape which are essentially the same as those used on the approved sample tape. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in material or processing, or both, and, when requested, sample tape. Production tape made by the revised procedures shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

4.5.1 Yarn Tests:

4.5.1.1 Denier: Shall be determined in accordance with FED-STD-191, Method 4021, and as follows:

4.5.1.1.1 Measure a 900-mm length of yarn to the nearest millimetre.

4.5.1.1.2 Weigh the yarn sample to the nearest milligram.

4.5.1.1.3 Calculate the denier (weight per length) as follows:

Denier = wt in g of 9,000 m = wt of 900 mm sample x 10,000.

4.5.1.2 Carbonization: Shall be determined in accordance with FED-STD-191, Method 1534, and as follows:

4.5.1.2.1 Apparatus: A suitable melting point apparatus meeting test method requirements shall be used.

4.5.1.2.2 Procedure: A sufficient number of fibers shall be removed from the yarn sample, or tape sample, for observation of carbonization. The temperature at which the yarn begins to stiffen or char shall be considered the end point of the test.

4.5.2 Tape Tests: Shall be as follows:

Requirement	Test Method	Number of Determinations per Requirement
Width	ASTM D1910	3
Weight	ASTM D1910	3
Yarn Count	FED-STD-191, Method 5050	3
Weave	FED-STD-191, Method 5050	1
Breaking Strength		
Unaged	4.5.2.1	5
Aged	4.5.2.2	5
Elongation	4.5.2.1	5
Air Permeability	4.5.2.3	3

4.5.2.1 Breaking Strength and Elongation (Unaged): Breaking strength and elongation of the unaged tape shall be determined in accordance with ASTM D1682, except as given below. The strength and elongation shall be reported as the average of fi e tests made on each sample. The test report shall list any optional exception to ASTM D1682 test conditions used.

4.5.2.1.1 The following exceptions are permitted for 300 lb (1 335 N) and 1,000 lb (4,450 N) tape:

4.5.2.1.1.1 The test specimen shall be full width and warp tests only shall be performed.

4.5.2.1.1.2 The jaws of the clamp shall be at least 0.5 in. (12 mm) wider than the full specimen width.

4.5.2.1.2 The following optional exceptions are permitted for 3,000 lb (13,345 N) tape:

4.5.2.1.2.1 Split drum jaws may be used.

4.5.2.1.2.2 The no-load rate of jaw separation may be 4 in. (100 mm) per minute.

4.5.2.1.2.3 The distance between centers of jaws or drums may be 10.5 in. (262 mm) at the beginning of test.

4.5.2.1.2.4 In lieu of an elongation recording device on the testing machine, elongation may be measured using a minimum distance of 5 in. (125 mm) on test specimens and measuring the maximum extension at 90% of breaking load.

4.5.2.2 Breaking Strength (Aged): The size of the specimen for oven aging shall be the same as for unaged breaking strength specimens. The specimens shall be placed in an oven at 260°C ± 6° (500°F ± 10°) for 4 hr ± 0.25. Upon removal, the specimens shall be conditioned at 20°C ± 1° (70°F ± 2°) and 65% ± 2 relative humidity for not less than 4 hr and then tested for breaking strength as specified in 4.5.2.1. The loss in breaking strength due to the aging treatment shall be reported as percent loss from that of the unaged specimens.

4.5.2.3 Air Permeability: Shall be determined in accordance with ASTM D737, except that the fabric orifice shall have an area of 1 sq in. (645 mm^2). Report value as the average of three specimens for each determination.

4.5.3 Examination of Length:

4.5.3.1 Individual Spool: The spool shall be examined for gross length and the number and length of pieces in the spool. Any gross length (spool) found to be more than 2 yd (1.8 m) below the gross length marked on the piece ticket, or any spool found to contain more than the number of pieces allowed in the detail specification, or any one piece less than 40 yd (37 m) in length shall be considered as a defect with respect to length. The unit of product for this examination shall be 1 spool. The sample size and acceptance number shall conform to Table II.

4.5.3.2 Total Length in Sample: The lot shall be unacceptable if the total of the actual gross length of spools in the sample is less than the total of the gross lengths marked on the ticket.

4.5.4 Examination for Compliance with Textile Fiber Products Identification Act: During the examination of individual spools for length, each spool in the sample shall be examined for conformance to the Textile Fiber Products Identification Act. Each spool not labeled in accordance with this act shall be a defect. The lot shall be unacceptable if two or more of these defects occur.

4.5.5 Examination of Preparation for Delivery: An examination shall be made to determine conformance to the packaging, packing, and marking requirements of the applicable specification or regulation. Defects shall be defined as specified below. The sample unit shall be one shipping container prepared for delivery with the exception that it need not be sealed. Defects of closure listed below shall be examined on shipping containers prepared for delivery. The lot size shall be the number of containers in the inspection lot. The inspection level shall be S-2 and the AQL shall be 4.0 defects per 100 units.

Examine	Defects
Marking (exterior and interior)	Omitted, incorrect, illegible, of improper size, location, sequence, or method of application.
Materials	Any component missing. Any component damaged, affecting serviceability.
Workmanship	Inadequate application of components, such as incomplete closure of case liners, container flaps, loose strapping, inadequate stapling. Bulging or distortion of containers.
Package Weight	Gross/net weight exceeds requirements.

4.6 Reports:

4.6.1 The vendor of the tape shall furnish with each shipment three copies of a report showing the results of tests to determine conformance to the acceptance tests specified herein and in the applicable detail specification and stating that the tape conforms to the other technical requirements of this specification and the applicable detail specification. This report shall include the purchase order number, AMS 3792 and the applicable detail specification number, vendor's tape designation, lot number, quantity, and specified tape strength.

4.6.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, AMS 3792 and the applicable detail specification number, contractor or other direct supplier of tape, supplier's product identification, part number, and quantity. When tape for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of tape to determine conformance to the requirements of this specification and the applicable detail specification and shall include in the report either a statement that the tape conforms or copies of laboratory reports showing the results of tests to determine conformance.