

AEROSPACE MATERIAL SPECIFICATION

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Superseding AMS 3801

Cloth, Parachute - Meta-Aramid, Low Modulus

1. SCOPE:

1.1 Form: This specification covers a low modulus meta-aramid in the form of cloth.

1.2 Application: Primarily for use in construction of parachutes.

1.3 Classification: Low modulus meta-aramid parachute cloth shall be as specified in the applicable detail specification, classified by weight and weave. An example is shown in 8.2. The cloth covered by each detail specification appears as part of the title.

1.4 Safety - Hazardous Materials: While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The applicable issue of other referenced publications shall be the issue in effect on the date of the purchase order.

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2.1 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

- ASTM D 737 - Air Permeability of Textile Fabrics
- ASTM D 1388 - Stiffness of Fabrics
- ASTM D 1777 - Measuring Thickness of Textile Materials
- ASTM D 2261 - Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)
- ASTM D 3776 - Mass per Unit Area (Weight) of Woven Fabrics

2.2 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, except as specified in 2.2.3.

2.2.1 Federal Specifications:

PPP-P-1133 - Packaging of Synthetic Fiber Fabrics

2.2.2 Federal Standards:

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

2.2.3 Other Publications: Available from the 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 cloth shall consist of all requirements specified herein in addition to requirements specified in the applicable detail specification. In case of conflict between requirements of this specification and an applicable detail specification, requirements of the detail specification shall govern.

3.2 Material: Cloth shall be woven from low modulus meta-aramid fibers, which shall not char at a temperature lower than 355°C (671°F), determined in accordance with 4.5.1.2. 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:

Denier	4.5.1.1
Twist	FED-STD-191, Method 4054
Carbonization	4.5.1.2 (See 3.3.1)

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 cloth.

3.4 Properties of Cloth: Shall be as specified in the applicable detail
0 specification, determined in accordance with the following test methods:

Thread Count (3.4.1)	FED-STD-191, Method 5050
Thickness (3.4.1)	ASTM D 1777 (3.4.2)
Weight (3.4.1)	ASTM D 3776
Breaking Strength (3.4.1)	4.5.2.1
Elongation (3.4.1)	4.5.2.1
Tear Strength (3.4.1)	ASTM D 2261
Air Permeability	4.5.2.2
Weave	Visual
Stiffness (3.4.3)	ASTM D 1388
pH	FED-STD-191, Method 2811

3.4.1 For resin treated cloth, these tests shall be performed on the cloth prior to the resin treatment.

3.4.2 A load of 6 ounces force (1.7 N) shall be applied and the presser foot diameter shall be 3/8 inch (9.5 mm).

3.4.3 Applicable to resin treated cloth only.

3.5 Quality: Cloth, as received by purchaser, shall be evenly woven and free from foreign materials and from imperfections detrimental to usage of the cloth.

3.5.1 Imperfections: Acceptability of each lot of cloth shall be based on imperfections defined in FED-STD-4.

3.5.2 Yard-by-Yard Examination: Each roll in the sample shall be examined on the face side only. When the total length in the roll does not exceed 100 yards (91 m), the entire length of the roll shall be examined. When the total length in the roll exceeds 100 yards (91 m), only 100 yards (91 m) shall be examined. All imperfections as defined in FED-STD-4, which are clearly noticeable at normal inspection distance of 1 yard (1 m) shall be scored and assigned demerit points as listed in 4.3.1.2.2. No linear yard (m), increments of 1 yard (1 m) on the measuring machine), from any one roll within the sample shall be penalized more than 4 points. The lot shall be unacceptable if the points per 100 square yards (84 m²) of the total length examined exceeds 50 points. The lot shall be unacceptable if the points per 100 square yards (84 m²) of two or more individual rolls exceeds 60 points. If no individual roll exceeds the point level, the lot shall be acceptable with respect to this characteristic. If one roll exceeds the point level, a second sample equal in size to the first, shall be examined only for individual roll quality examination. The lot shall be unacceptable if one or more rolls in the second sample exceeds the point level. Point computation for lot quality and individual roll quality shall be as follows:

3.5.2.1 Using Inch/Pound Units:

$$\frac{\text{Total points scored in sample} \times 3600}{\text{Width of cloth, inches,} \times \text{total length, yards, inspected}} = \frac{\text{Points}}{\text{per 100 square yards}}$$

3.5.2.2 Using SI Units:

$$\frac{\text{Total points scored in sample} \times 100.00}{\text{Width of cloth, mm} \times \text{total length, m, inspected}} = \frac{\text{Points}}{100 \text{ m}^2} \text{ per}$$

4. QUALITY ASSURANCE PROVISIONS:

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

4.2 Classification of Tests: Tests for all technical requirements of this specification and the applicable detail specification are acceptance tests and preproduction tests and shall be performed prior to or on the initial shipment of cloth to purchaser, on each lot, when a change in ingredients and/or processing 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 material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling and Testing: Shall be as follows:

4.3.1 For Acceptance Tests: Each lot of cloth shall be visually examined as required below 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 three.

4.3.1.1 Yarn Tests: Prior to weaving the cloth, the yarn shall be sampled for tests as specified below. The lot size shall be expressed in pounds (kg) and the sample unit shall be 500 yards (457 m) of the yarn. The lot shall be unacceptable if one or more sample units fail to meet any test requirements specified. The sample size shall be as follows:

Lot Size		Sample Size (Number of Units)
Pounds	Kilograms	
Up to 1000, incl	Up to 454, incl	3
Over 1000 to 5000, incl	Over 454 to 2268, incl	5
Over 5000	Over 2268	7

- 4.3.1.2 Yard-by-Yard Examination of Cloth: The unit of cloth for this examination shall be 1 square yard (1 m²). The sample size shall be in accordance with the following:

Lot Size		Sample Size (Number of Rolls)
Yards	Metres	
Up to 3,200, incl	Up to 2926, incl	8
Over 3,200 to 10,000, incl	Over 2926 to 9144, incl	13
Over 10,000	Over 9144	20

- 4.3.1.2.1 No more than one roll shall be taken from any shipping container unless the number of shipping containers in the lot is less than the required number of rolls, in which case, all shipping containers shall be included in the sample.

- 4.3.1.2.2 Demerit Points: Demerit points shall be assigned in the yard-by-yard examination as follows:

Imperfections up to 3 inches (76 mm), incl, in any dimension	1 demerit point
Imperfections over 3 to 6 inches (76 to 152 mm), incl, in any dimension	2 demerit points
Imperfections over 6 to 9 inches (152 to 229 mm), incl, in any dimension	3 demerit points
Imperfections over 9 inches (229 mm) in any dimension	4 demerit points

- 4.3.1.2.2.1 The following imperfections, when present, shall be scored 4 points for each linear yard (linear metre) in which they occur:

Color other than as specified in the applicable detail specification
Baggy, ridgy, or wavy cloth
Objectionable odor
Width less than specified

- 4.3.1.3 Properties of Cloth: The unit of cloth for property determination shall be not less than specified below; the sample size shall be as specified in 4.3.1.2:

- 4.3.1.3.1 Cloth not containing a resin treatment: 2 linear yards (1.8 linear m),
continuous piece, full width
- 4.3.1.3.2 Cloth containing a resin treatment: 1.5 linear yards (1.4 linear m),
continuous piece, full width

4.3.1.4 A lot shall be all cloth of a single weight produced in a single production run under the same fixed conditions and presented for vendor's inspection at one time.

4.3.1.5 When a statistical sampling plan has been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6 shall state that such plan was used.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.4 Approval:

4.4.1 Sample cloth shall be approved by purchaser before cloth for production use is supplied, unless such approval be waived by purchaser. Results of tests on production cloth 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 cloth which are essentially the same as those used on the approved sample cloth. 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 ingredients and/or processing and, when requested, sample cloth. Production cloth made by the revised procedure 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 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 in grams to the nearest 10 milligrams.

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

$$\text{Denier} = \text{wt in grams of 9000 m} = \text{wt of 900-mm sample} \times 10,000.$$

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 shall be used to determine the carbonization point of the yarn.

4.5.1.2.2 Procedure: A sufficient number of fibers shall be removed from the yarn 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 Cloth Tests:

4.5.2.1 Breaking Strength: Shall be determined in accordance with FED-STD-191, Method 5104, for cloth without resin coating and Method 5100 for resin treated cloth. The test specimens for both unaged and oven aged determinations shall be prepared so that the warp direction specimens contain the same warp yarns and the filling specimens contain the same filling yarns. Acceptance shall be based on the average of five specimens from each sample.

4.5.2.1.1 Breaking Strength After Aging: The specimen size shall be the same as in the unaged breaking strength determination. The specimens shall be aged in an oven at $250^{\circ}\text{C} \pm 5$ ($482^{\circ}\text{F} \pm 9$) for 24 hours ± 0.1 , removed from the oven, and conditioned at standard conditions for 4 hours ± 0.1 prior to testing.

4.5.2.2 Air Permeability: Shall be determined in accordance with ASTM D 737 using a 2-yard (1.8-m) sample from each roll to be tested. Failure of the specimen to meet the air permeability requirement shall be cause for rejection of the roll represented.

4.5.2.3 Examination for Length:

4.5.2.3.1 Individual Rolls: During the yard-by-yard examination, each roll in the sample shall be examined for length. Any length found to be less than the minimum or more than the maximum specified, or more than 2 yards (1.8 m) below the length marked on the ticket, or any roll found to contain more than the specified number of pieces, or any one piece less than 40 yards (37 m) shall be considered an imperfection with respect to length. The lot shall be unacceptable if two or more rolls in the sample are defective in respect to length.

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

4.5.2.4 Examination of Compliance with Textile Fiber Products Identification Act: During the examination of individual rolls for length, each roll in the sample shall be examined for conformance to the Textile Fiber Products Identification Act. Each roll not labeled in accordance with this act shall be an imperfection. The lot shall be unacceptable if two or more of these imperfections occur.

4.5.2.5 Examination of Preparation for delivery: An examination shall be made to determine conformance to the packaging requirements of PPP-P-1133. The lot size shall be the number of containers in the inspection lot.

4.6 Reports: The vendor of cloth shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance tests and stating that the cloth conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS-3801A and applicable detail specification number and their revision letters, vendor's material designation, quantity, and specified cloth weight.

4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the cloth may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the cloth represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

5.1.1 Cloth shall be supplied in rolls of the size specified in the applicable detail specification.

5.1.2 The face side of the cloth shall be identified by stamping on that side the word "Face" at each end of the roll.

5.1.3 Each roll shall have a label or tag legibly marked with not less than the following information and attached in such a manner as to remain in place until all cloth has been removed from the roll:

CLOTH, PARACHUTE, META-ARAMID, LOW MODULUS
AMS-3801A*
WIDTH _____ WEAVE _____
WEIGHT PER YARD (METRE) _____
MANUFACTURER'S IDENTIFICATION _____
PRODUCT DESIGNATION _____
QUANTITY _____
LOT NUMBER _____
ROLL NUMBER (If used) _____
STOCK NUMBER _____
DATE OF MANUFACTURE _____

* Insert applicable detail specification number.

5.1.4 Each roll shall also be labeled, ticketed, or invoiced for fiber content in accordance with the Textile Fiber Products Identification Act.