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400 Commonwealth Dr., Warrendale, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 3794

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THREAD, ARAMID, SPUN STAPLE

1. SCOPE:

1.1 Form: This specification covers a spun staple, high temperature, aramid thread.

1.2 Application: Primarily for use in machine sewing of flight clothing.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications 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 D2146 - Propylene Plastic Molding and Extrusion Materials

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

REAFFIRMED 10/91

2.3.1 Federal Specifications:

L-P-394 - Plastic Molding Material (Propylene Plastics, Injection and Extrusion)
L-P-1183 - Plastic Molding Material, Acrylonitrile Butadiene Styrene (ABS), Rigid
PPP-P-50 - Packaging and Packing of Thread for Domestic and Overseas Shipment

2.3.2 Federal Standards:

FED-STD-191 - Textile Test Methods

2.3.3 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Material: The fiber used in the manufacture of the thread shall be aramid of 1.5 to 2.0 denier per filament and shall be 1.5 to 2.0 in. (38 to 50 mm) in staple lengths. The fiber shall not carbonize at lower than 357°C (675°F), determined in accordance with FED-STD-191, Method 1534.

3.1.1 Supplier's certificate of compliance will be acceptable for denier, staple length, and carbonization temperature of the aramid fiber.

3.2 Properties: Thread shall conform to the following requirements; properties specified apply to the average of determinations on a sample unit (See 4.3.1.1):

3.2.1 Twist: The direction of final twist shall "Z" for all thread. Each of the individual plies shall be initially twisted with no less than the number of turns per in. (25.4 mm) to be used in the final twist and in the opposite direction to the final twist. The final plied twist shall be not less than 18 turns per in. (25.4 mm).

3.2.2 Color: Shall be as specified by purchaser.

3.2.3	Ply, final	3
3.2.4	Length per unit weight	
	min	11,000 yd per lb (22,175 m/kg)
	max	12,500 yd per lb (25,200 m/kg)
3.2.5	Breaking Strength, min	
	Original	2.2 lb (10 N)
	Percent of Original After Aging	85%
3.2.6	Elongation, max	30%

3.2.7 Weight per Yarn Holder, average, min 8.00 oz ± 0.08 (255 g ± 25)

3.3 Quality: Thread, as received by purchaser, shall be clean and free from foreign materials and from imperfections detrimental to usage of the thread.

3.3.1 The thread shall be examined for visual defects specified in Table I. The defects shall be counted regardless of their proximity to each other except where two or more defects represent a single local condition, in which case only the more serious defect shall be counted. The acceptance quality level (AQL) shall be 1.0 major and 2.5 total defects per 100 units.

TABLE I

Classification of Visual Defects

Characteristic	Visual Defect	Major	Minor
Break	Any.		X
Construction workmanship	Unevenly spun, twisted, or plied.	X	
Holder	Cut, torn, chafed, or otherwise damaged holder, affecting the free unhampered unwinding of the thread, or the secure holding of thread winds or layers of winds on the holder.	X	
Identification marking	Missing, insecurely attached, illegible, incorrect, or incomplete.		X
Kinks or loops	Not removeable by normal tension.		X
Knots	In the ply.	X	
	In the singles.		X
Number of plies	Other than specified.	X	
Spot or stain	Clearly visible on individual strands of thread.		X
Winding	Improperly or not firmly wound, resulting in knots, kinks, entangling, or slippage during unwinding or otherwise affecting free unhampered unwinding of the thread.	X	

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the thread 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 thread conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and as preproduction tests and shall be performed prior to or on the initial shipment of thread to a purchaser, on each lot, when a change in material, 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 material 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 thread shall be visually examined for quality (3.3) 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 Unless otherwise specified, the sample unit for testing shall be one holder (cone or tube). Sample size shall be as follows:

Lot Size (in holders) 1/	Sample Size (in holders)
1 to 25, incl	1
26 to 90, incl	2
91 to 150, incl	3
Over 150	5

1/ The lot shall be unacceptable if one or more units of thread fail to meet any test requirement specified.

4.3.1.2 Examination for Visual Defects and Weight: The unit of thread shall be one holder (tube or cone) and the inspection level shall be in accordance with MIL-STD-105, Level S-3. The weight of each holder shall be subtracted from the combined weight of thread and the holder for determining the net weight of thread on the individual holder.

4.3.1.2.1 Average Net Weight: The lot shall be unacceptable if the average net weight [to the nearest 0.1 oz (3 g)] is less than the applicable net weight specified in 3.2.7.

4.3.1.3 When a statistical sampling plan and acceptance quality level (AQL) have 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 4.6.1 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 thread shall be approved by purchaser before thread for production use is supplied, unless such approval be waived by purchaser. Results of tests on production thread shall be essentially equivalent to those on the approved sample thread.

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

4.5 Test Methods: Shall be in accordance with Table II and the following:

4.5.1 Breaking Strength After Aging: A sample of 5 skeins of 15 yd (14 m) each shall be used for the aging test. The specimens shall be placed in an oven for 4 hr ± 0.1 at 260°C ± 5 (500°F ± 9). Upon removal, the specimens shall be conditioned at standard atmospheric conditions for not less than 4 hr and tested for breaking strength as specified in Table II. The breaking strength shall be the average of the results obtained from the specimens tested, and shall be reported to the nearest 1.0% of the original breaking strength.

TABLE II

Test Methods

Requirement	FED-STD-191 Test Method
Twist Direction	4050
Yarn Ply	Visual
Breaking Strength	4100
Breaking Strength After Aging	4100 and 4.5.1
Elongation	4100
Yards per lb (m/kg)	4010

4.5.2 Turns of Twist: The test for turns of twist per in. (25.4 mm) in the individual plies (singles yarn) shall be made in conjunction with that for the final (plied) twist. After recording the final twist and while the individual plies are straight between the jaws of the test machine, all plies but one shall be cut and removed. One clamp shall be opened, the slack thread drawn through, and the single ply remaining shall be reclamped under the specified tension. The counter shall be reset to zero. From this point, FED-STD-191, Method 4052, shall be followed.

4.6 Reports:

4.6.1 The vendor of thread shall furnish with each shipment a report showing the results of tests to determine conformance to the technical requirements of this specification. This report shall include the purchase order number, AMS 3794, vendor's material identification, lot number, and quantity.

4.6.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 3794, contractor or other direct supplier of thread, supplier's material identification, part number, and quantity. When thread for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of thread to determine conformance to the requirements of this specification and shall include in the report either a statement that the thread conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the thread 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 thread 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 Put-up: The thread shall be put up on a weight basis, 8 oz (255 g) per holder, on commercial tubes or cones. When plastic tubes are used, the material shall conform to 5.1.1.1 or 5.1.1.2. A tolerance of ±10% will be permitted on any one holder. The thread shall be in one continuous piece and shall be wound so that each turn and layer is free from entanglement.

5.1.1.1 The tubes shall be acrylonitrile-butadiene-styrene (ABS) rigid plastic conforming to L-P-1183, Type I, with the following values substituted in the table of property values of L-P-1183, Type I:

Izod Impact Strength per in. (25 mm) of notch at 23°C ± 2 (73°F ± 3), [1/8 in. (3 mm) sample], min	1.5 ft-lb (2.0 J)
Tensile Yield Stress, min	66,000 psi (455 MPa)
Deflection Temperature Under Load, 264 psi (1.8 MPa) fiber stress, min	90°C (190°F)
Modulus of Elasticity in Tension, min	39,000 psi (270 MPa)
Hardness, min	105 HRR
Specific Gravity, 23°/23°C (73°/73°F), max	1.2
Chemical Resistance, 40-hr immersion in heptane at 23°C ± 2 (73°F ± 3), weight change, max	5.0%

5.1.1.2 The tubes shall be molded from a virgin polypropylene homopolymer plastic conforming to L-P-394, determined in accordance with ASTM D2146.