MILITARY SPECIFICATION

REPAIR MATERIAL, NITRILE, FUEL, BLADDER, AIRCRAFT

1. SCOPE

1.1 Scope. This specification covers a repair material which can be used on inside and outside walls of self-sealing and non-self-sealing aircraft fuel bladders such as those conforming to MIL-T-5578 and MIL-T-6396C which are fabricated of nitrile coated fabrics.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein:

SPECIFICATIONS

Federal

TT-S-735	Standard Test Fluids, Hydrocarbon
PPP-P-1136	Packaging and Packing of Coated (Plastic, Rubber) and Laminated Fabrics

Military

MIL-T-5578	Tank, Fuel, Aircraft, Self-Sealing
MIL-T-6396	Tanks, Fuel, Oil, Water-Alcohol, Coolant Fluid, Aircraft, Non-Self-Sealing, Removable, Internal

STANDARDS

Federal

Federal Test Method Std. No. 191	Textile Methods
Fed Std No. 601	Rubber: Sampling and Testing

Military

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

MIL-STD-129 Marking for Shipment and Storage

(Copies of specifications, standards, drawings and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply:

American Society for Testing and Materials Publications

D412 Tension Testing of Vulcanized Rubber

D471 Change in Properties of Elastomeric Vulcanizates Resulting from Immersion in Liquids

D2240 Indentation Hardness of Rubber and Plastics by Means of a Durometer

(Copies of ASTM publications may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

3. REQUIREMENTS

3.1 First article inspection. The repair material furnished to this specification shall be a product which has met the first article inspection, as specified (see 4.3). Approval of the first article shall not relieve the supplier of the responsibility for compliance to the requirements of this specification.

3.2 Materials. The cured repair material shall be entirely suitable for the intended purpose and shall be of the same composition and quality as the material used for the first article sample.

3.3 Construction and physical properties

3.3.1 Construction. The basic construction of the repair material shall consist of three primary layers of material as shown in figure 1.

3.3.2 Physical properties

3.3.2.1 Base fabric. The physical properties of the base cloth shall conform to the requirements of table I.

Figure 1

1/ Bonding ply. This side of repair material shall be placed against the wall of the damaged cell. This ply shall consist of butadiene-acrylonitrile elastomer.

2/ Barrier. Continuous nylon film.

3/ Outerply. The outerply shall consist of one ply of butadiene-acrylonitrile nylon fabric. Additional plies are permissible providing all other requirements of this specification are met.

Table I. Base fabric requirements

Characteristic	Requirement
Weight, oz./sq. yd., min.	2.2
Thickness, max.	.010
Tensile strength, grab, pounds/inch, min.	
Warp	110
Filling	100

3.3.2.2 Elastomer material. The physical properties of the elastomer material shall conform to the requirements of table II.

3.3.2.3 Finished product. The physical properties of the finished product shall conform to the requirements of table III.

3.4 Dimensions. The length and width of the repair material shall be as specified by the procuring activity (see 6.2).

Table II. Elastomer material requirements

Characteristic	Requirement
Original:	
Tensile strength, psi, min.	1200
Elongation, percent, min.	500
Hardness, Type A durometer, points	50 ± 5
Fluid resistance, immersions:	
TT-S-735, Type III, 70 ± 2 hours at 75 ± 5°F	
Tensile strength change, percent, max.	-50
Elongation change, percent, max.	-50
Hardness change, points	-20
Volume increase, percent, max.	+30

Table III. Finished product requirements

Characteristic	Requirement
Original:	
Weight, oz./sq. yd., max.	34
Thickness, max.	.040
Tensile strength, grab, pounds/inch, min.	120 x 120
Adhesion, pounds/inch. width, min.	5.0
Fluid resistance:	
Permeability, fluid ounces/sq. ft./24 hr., max.	.025
After aging 70±2 hours at 75±5°F in TT-S-735 Type III	
Adhesion, pounds/inch, width, min.	4.0

3.5 Identification of product. Unless otherwise specified, the repair material shall be marked, on the outerply (see figure 1), to show the specification number, manufacturer, manufacturer's designation, and the cure date by quarter and year.

EXAMPLE: MIL-R- (USAF) XYZ Co.
MANUFACTURER'S DESIGNATION
CURE DATE 1Q70

The identification shall recur constantly from one end of the material to the other, shall be in intervals spaced 8 inches maximum apart on the line, shall be in rows spaced approximately five inches apart, and shall be clearly legible, contrasting in color, and not less than 3/8 inch high. The marking shall be applied by suitable means, using marking fluid that is not deleterious to the rubber coating. The marking shall not be obliterated by normal handling.

3.6 Workmanship. The workmanship of this material shall be in accordance with manufacturing practice covered in the construction of flexible fuel bladders. (See MIL-T-6396C).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may utilize his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specifications where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements. Inspection records shall be kept complete and available to the procuring activity at all times.

4.2 Classification of inspection. The inspection and testing of the repair material shall be classifed as follows:

a. First article inspection (see 4.3).

b. Quality conformance inspection (see 4.4).

4.3 First article inspection. First article inspection shall consist of all the tests specified.

4.3.1 First article test sample. The first article test sample shall consist of one square yard of finished product, one square foot of each of the base cloth and elastomeric material.

4.4 Quality conformance inspection

4.4.1 Sampling for inspection. Sampling for quality conformance inspection and tests shall be in accordance with MIL-STD-105, except where otherwise indicated herein.

4.4.2 Inspection of material and components. The supplier is responsible for insuring that materials and components used were manufactured, tested, and inspected in accordance with referenced subsidiary specifications and standards to the extent specified, or if none, in the accordance with this specification (see 4.1). In the event of conflict, this specification shall govern.

4.4.3 Inspection of the finished product. The finished product shall be inspected for defects in appearance and workmanship (see table IV). The sample unit for this examination shall be one square yard. The inspection level for determining the sample size shall be Level I and the acceptable quality level (AQL) shall be 2.5 expressed in defects per 100 units.

Table IV. Examination for defects in appearance and workmanship.

Examine	Defect
Appearance and Workmanship	Holes, tears, cuts, cracks present.
	Not clean cut edges.
	Blisters or lumps.
	Delaminated or unbonded areas.
	Uneven coating.

4.4.4 Examination for defects in preparation for delivery. An examination shall be made to determine that the packaging, packing and markings comply with section 5. The sample unit for this examination shall be one shipping container fully packed, selected just prior to the closing operation. Shipping containers fully prepared for delivery shall be examined for closure defects.

EXAMINE	DEFECT
Sheets	Not interleaved; separator sheets do not fully cover the full area of contact between the sheets.
Packing	Not level specified; not in accordance with contract requirements. Container not as specified, closures not accomplished by specified or required methods or materials. Any nonconforming component, component missing, damaged or otherwise defective, affecting serviceability. Inadequate application of components, such as incomplete closure of case liners, containing flaps loose or inadequate strapping, bulged or distorted containers.
Count	Less than specified or indicated quantity, linear footage, or units, as applicable.
Weight	Gross weight exceeds specified requirements.
Markings	Interior or exterior markings, as applicable, omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements, date of cure, storage instructions missing.

The sample size shall be in accordance with inspection Level II of MIL-STD-105 and the AQL related to percent (%) defective shall be 2.5.

4.4.5 Quality conformance testing of the finished product. The finished product shall be tested for conformance to the requirements of table III of this specification, except for permeability. The sample unit shall be one square yard of the finished product. The inspection level for determining the sample size shall be S-2. The lot size shall be expressed in yards of the finished product. There shall be no evidence of failure to meet the specified requirements.

4.5 Test conditions. All test specimens shall be conditioned and tested at normal laboratory conditions unless otherwise specified herein or in the applicable ASTM method. In case of dispute over test results, the tests shall be repeated using standard conditions (see 4.5.1).

4.5.1 Standard conditions. Standard conditions shall be 50 ± 15 percent relative humidity and a temperature of 75° ± 5° F.

4.6 Test methods

4.6.1 Physical properties. Unless otherwise specified herein, the physical properties shall be determined in accordance with the methods of testing as listed in table V. The requirements specified in section 3 apply to the average of the determinations made on a unit of product for test purposes as specified in the applicable test methods.

Table V. Test methods

TEST	METHOD NO.
Weight	5041 1/
Thickness	5030 1/
Tensile strength, grab	5100 1/
Permeability	Para 4.6.12, MIL-T-6396
Adhesion	8011 2/
Tensile strength and elongation	D412 3/
Hardness	D2240 3/
Volume increase	D471, Para 9 3/

1/ Federal Test Method Standard No. 191.

2/ Federal Test Method Standard No. 601.
Adhesion shall be defined simply as the adhesion between the outerply and the bonding ply, with separation occurring anywhere in between.

3/ ASTM

4.6.2 Fluid resistance. The immersed test specimens shall be exposed to the time and temperature as specified in tables II and III in accordance with ASTM D471. (Immediate Deteriorated Properties), changes in tensile strength, strength, elongation, hardness, volume, and adhesion tests shall be determined

as specified (see 4.6.1). Adhesion shall be tested within 10 minutes after removal from the fluid.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Packaging shall be level A or C as specified (see 6.2).

5.1.1 Levels A and C. The repair material shall be packaged in accordance with the applicable requirements of PPP-P-1136.

5.2 Packing. Packing shall be level A, B and C as specified (see 6.2).

5.2.1 Levels A, B and C. The repair material shall be packed in accordance with PPP-P-1136.

5.3 Marking. In addition to any special markings required by the contract or order, interior packages and shipping containers shall be marked in accordance with the requirements of MIL-STD-129. The identification shall be as follows:

REPAIR MATERIAL, NITRILE, FUEL BLADDER, AIRCRAFT
COMPOUND NUMBER, LOT NUMBER
SPECIFICATION MIL-R- (USAF)
CURE DATE (QUARTER AND YEAR)
STORE IN A COOL, DRY PLACE

6. NOTES

6.1 Intended use. The repair material covered by this specification is intended for use on inside and outside repairs of self-sealing and non-self-sealing fuel bladders which are fabricated from nitrile coated fabrics. This material is not intended for application directly over polyurethane materials.

6.2 Ordering data. Procurement document should specify:

a. Title, number, and date of this specification.
b. Dimensions and tolerances.
c. Quantity.
d. Detail drawing and additional requirements, if any.
e. First article inspection.
f. Selection of applicable levels of packaging and packing (see 5.1 and 5.2).

6.3 First article test. First article tests are required for the repair material furnished to this specification. A copy of the first article test report shall be furnished the Air Force Materials Laboratory, ATTN: LAE, Wright-Patterson AFB, Ohio 45433. The first article tests need not be repeated for new orders provided the materials and processes have not been changed and a certified statement to this effect is furnished to the procuring activity. The waiving of the first article tests will be strictly at the discretion of the procuring activity. First article tests will not be acceptable if they are more than 3 years old.

Custodian:
Air Force - 11

Reviewer activity:
Air Force - 82

Preparing activity:
Air Force - 11

Project Number: 9320-F153