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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 1541A
Superseding AMS 1541

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CLEANER, FUEL DROP TANK
Water-Soluble

1. SCOPE:

1.1 Form: This specification covers a water-soluble, oil-dispersing cleaner in the form of a liquid.

1.2 Applicable: Primarily for cleaning and purging of external, removable fuel tanks.

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) and Aerospace Recommended Practices (ARP) 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
AMS 2825 - Material Safety Data Sheets
AMS 4027 - Aluminum Alloy Sheet and Plate, 1.0Mg - 0.60Si - 0.28Cu - 0.20Cr (6061-T6)

2.1.2 Aerospace Recommended Practices:

ARP 1511 - Corrosion of Low-Embrittling Cadmium Plate by Aircraft Maintenance Chemicals
ARP 1512 - Corrosion of Aluminum Alloys by Aircraft Maintenance Chemicals, Sandwich Test

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

ASTM D56 - Flash Point by Tag Closed Tester
ASTM D1568 - Sampling and Chemical Analysis of Alkylbenzene Sulfonates
ASTM D2667 - Biodegradability of Alkylbenzene Sulfonates
ASTM E70 - pH of Aqueous Solutions with the Glass Electrode
ASTM F483 - Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
ASTM F485 - Effects of Cleaners on Unpainted Aircraft Surfaces
ASTM F503 - Preparing Aircraft Cleaning Compound, Liquid Type, for Storage Stability Testing

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

2.3.1 Federal Specifications:

PPP-P-704 - Pails, Metal (Shipping, Steel, 1 Through 12 Gallon)

2.3.2 Federal Standards:

Federal Test Method Standard No. 791 - Lubricant, Liquid Fuel and Related Products, Methods of Testing

2.3.3 Military Specifications:

MIL-D-5624 - Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-D-16791 - Detergent, General Purpose, (Liquid, Nonionic)

2.3.4 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Material: The composition of the cleaner shall be optional with the manufacturer but should contain water, biodegradable surfactants, and other additives as required to produce a product soluble in water and meeting the requirements of 3.2.

3.2 Properties: The cleaner shall conform to the following requirements; tests shall be performed in accordance with specified test methods on the product supplied in concentrated form and diluted with distilled or deionized water to use concentration recommended by the manufacturer, except as otherwise specified in 3.2.10.1:

3.2.1 Corrosion of Metal Surfaces:

3.2.1.1 Sandwich Corrosion: Specimens, after test, shall show a rating not worse than 2, determined in accordance with ARP 1512.

3.2.1.2 Total Immersion Corrosion: The cleaner shall neither show evidence of corrosion nor cause a weight change of any single panel of AMS 4027 aluminum alloy greater than 0.3 (mg/cm^2)/24 hr, determined in accordance with ASTM F483.

3.2.1.3 Low-Embrittling Cadmium Plate: Panels coated with low-embrittling cadmium plate shall not show a weight change greater than 0.3 (mg/cm^2)/24 hr, determined in accordance with ARP 1511.

3.2.2 Effect on Seal and Gasket Material: The cleaner shall not produce a change in volume of Standard "L"-type rubber greater than ±5%, determined in accordance with Federal Test Method Standard 791, Method 3603.4, except immersion shall be for 4 hr ± 0.25 at 25°C ± 3 (77°F ± 5).

3.2.3 Flash Point: Shall be not lower than 60°C (140°F), determined in accordance with ASTM D56.

3.2.4 Effect on Unpainted Surfaces: The cleaner, tested in accordance with ASTM F485, shall neither produce streaking nor leave any stains requiring polishing to remove.

3.2.5 pH: Shall be 7.0 ± 0.5, determined in accordance with ASTM E70 on the concentrated cleaner.

3.2.6 Temperature Stability: The cleaner shall not show chemical or physical deterioration, including evidence of discoloration, layering, or other change denoting loss of stability, after exposure to 60°C ± 5 (140°F ± 9) for 4 hr ± 0.5.

3.2.7 Miscibility with Jet Fuel: The cleaner shall be completely miscibile with MIL-T-5624, Grades JP4 and JP5, jet fuel to make a uniform solution free of lumps, layering of ingredients, or sediment.

3.2.8 Storage Stability: The cleaner shall neither show separation from exposure to heat or cold nor show an increase in turbidity greater than a control sample equally diluted to use concentration with deionized water, determined in accordance with ASTM F503.

3.2.9 Biodegradability: Surfactants used shall be not less than 90% biodegradable, determined in accordance with ASTM D2667. The vendor of the cleaner shall obtain certification from the surfactant manufacturer of the percent biodegradability of the surfactants.

3.2.10 Performance: The cleaner shall remove all traces of MIL-T-5624, Grades JP4 and JP5, jet fuel, determined in accordance with 3.2.10.1 at 10°C (50°F) or higher.

3.2.10.1 A 5-gal storage drum conforming to PPP-P-704 shall be used to simulate a fuel tank. A 1.5 - 2 in. (38 - 50 mm) diameter drain hole shall be placed in the bottom of the tank and a rubber stopper shall be fitted in the opening. The drum shall be washed with a 1% solution of detergent conforming to MIL-D-16791, Type I, rinsed with water, and dried with oil-free air until the reading for combustible vapors of the container is zero when tested with a combustible gas detector (See 8.2). One pint of fuel conforming to MIL-T-5624, Grade JP-5, shall be placed in the container. The container shall be closed and rotated to allow the fuel to contact all the inside surfaces. The cap shall be opened and the drain plug removed. All liquid fuel shall be drained from the drum. The interior of the drum shall give a positive indication of combustible vapors; if it does not, repeat the addition of fuel, drum rotation, and draining. The drain plug shall be inserted. Cleaning solution (25 mL of the cleaner diluted with 500 mL of water) shall be poured into the drum and the cap shall be closed. The container shall be shaken and rotated for not less than 2 min. so that all surfaces are coated with the cleaning solution. The drain plug shall be removed and the cleaning solution allowed to drain. The interior of the drum shall be rinsed with clear, warm water and allowed to drain. The interior of the drum shall be checked for the presence of combustible vapors. If the meter reads above zero, it constitutes a failure of the cleaner to meet requirements of this test.

3.3 Quality: The cleaner, as received by purchaser, shall be homogeneous, uniform in color, and free from skins and lumps and from foreign materials detrimental to usage of the cleaner.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the cleaner 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 4.5. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the cleaner conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for effect on unpainted surfaces (3.2.4), pH (3.2.5), and miscibility with jet fuel (3.2.7) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for corrosion of metal surfaces (3.2.1), effect on seal and gasket material (3.2.2), flash point (3.2.3), temperature stability (3.2.6), and performance (3.2.10) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.2.3 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed on the initial shipment of cleaner to a purchaser, when a change in material and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.3.1 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 agency, the contracting officer, or the request for procurement.

4.3 Sampling: Sampling shall be in accordance with ASTM D1568, unless otherwise specified by purchaser; a lot shall be all cleaner produced in a single production run from the same batches of raw materials under the same fixed conditions and presented for vendor's inspection at one time.

4.4 Approval:

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

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

4.5 Reports: Unless waived by purchaser, the vendor of cleaner shall furnish with each shipment three copies of a report showing the results of tests to determine conformance to the acceptance test requirements and, when performed, to the periodic test requirements and stating that the cleaner conforms to the other technical requirements of this specification. This report shall include the purchase order number, AMS 1541A, manufacturer's identification, lot number, and quantity.

4.5.1 A material safety data sheet conforming to AMS 2825 or equivalent shall be supplied to each purchaser prior to, or concurrent with, the report of preproduction test results or, if preproduction testing be waived by purchaser, concurrent with the first shipment of cleaner for production use. All requests for modification of formulation shall be accompanied by a similar form for the proposed formulation.

4.5.2 The vendor of cleaner shall supply a certificate of compliance to biodegradability requirements (3.2.9).