



AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AMS 1529A

Superseding AMS 1529

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CLEANER FOR AIRCRAFT EXTERIOR SURFACES Emulsion, Foam-On, Pressure-Spraying Type

1. SCOPE:

- 1.1 **Form:** This specification covers an emulsion-type, foam-on, pressure-spraying cleaner in the form of a liquid.
- 1.2 **Application:** Primarily for removing soils from painted and unpainted exterior surfaces of aircraft using foam-forming equipment.

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 Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

- AMS 2350 - Standards and Test Methods
 AMS 2470 - Anodic Treatment of Aluminum Alloys, Chromic Acid Process
 AMS 2475 - Protective Treatments, Magnesium Base Alloys
 AMS 2825 - Material Safety Data Sheets
 AMS 4037 - Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate)
 AMS 4041 - Aluminum Alloy Sheet and Plate, Alclad, 4.4Cu - 1.5Mg - 0.60Mn (Alclad 2024 and 1-1/2% Alclad 2024-T3 Flat Sheet; 1-1/2% Alclad 2024-T351 Plate)
 AMS 4049 - Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.26Cr (Alclad 7075; -T6 Sheet, -T651 Plate)
 AMS 4376 - Magnesium Alloy Plate, 3.0Al - 1.0Zn (AZ31B-H26)
 AMS 4911 - Titanium Alloy Sheet, Strip, and Plate (6Al - 4V), Annealed

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

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

- ASTM A109 - Steel, Carbon, Cold Rolled Strip
- ASTM D56 - Flash Point by Tag Closed Tester
- ASTM D1568 - Sampling and Chemical Analysis of Alkylbenzene Sulfonates
- ASTM D2667 - Biodegradability of Alkylbenzene Sulfonates
- ASTM F483 - Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
- ASTM F484 - Stress Cracking of Acrylic Plastics in Contact with Liquid or Semi-Liquid Compounds
- ASTM F485 - Effects of Cleaners on Unpainted Aircraft Surfaces
- ASTM F502 - Determination of Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
- ASTM F503 - Preparing Aircraft Cleaning Compound, Liquid Type, for Storage Stability Testing
- ASTM F519 - Hydrogen Embrittlement Testing of Aerospace Materials

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

2.3.1 Military Specifications:

- MIL-P-25690 - Plastic, Sheets and Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant
- MIL-C-81762 - Cleaner, Pressure, Cleaning Compound Water, Foaming

2.3.2 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, emulsifiers, solvents, and foam stabilizers to produce a foamable product completely 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 at use dilution recommended by the manufacturer:

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 product shall neither show evidence of corrosion of the panels nor cause a weight change of any single test panel greater than the following, determined in accordance with ASTM F483:

Panel	Weight Change (mg/cm ²)/24 hr
AMS 4037 Aluminum Alloy, anodized as in AMS 2470	0.3
AMS 4041 Aluminum Alloy (optional)	0.3
AMS 4049 Aluminum Alloy	0.3
AMS 4376 Magnesium Alloy, dichromate treated as in AMS 2475	0.2
AMS 4911 Titanium Alloy	0.1
ASTM A109, Temper No. 1, Carbon Steel	0.8

- 3.2.1.3 Low-Embrittlement Cadmium Plate: Panels coated with low-embrittling cadmium plate shall not show a weight change greater than $0.3 \text{ (mg/cm}^2\text{) / 24 hr}$, determined in accordance with ARP 1511.
- 3.2.2 Hydrogen Embrittlement: The product shall be non-embrittling, determined in accordance with ASTM F519, Type 1a, 1c, or 2a.
- 3.2.3 Flash Point: Shall be not lower than $60^\circ\text{C (140}^\circ\text{F)}$, determined in accordance with ASTM D56.
- 3.2.4 Effect on Plastics: There shall be no crazing or staining of stretched MIL-P-25690 plastic, determined in accordance with ASTM F484.
- 3.2.5 Effect on Painted Surfaces: The product shall neither decrease the hardness of the paint film by more than two pencil hardness levels nor shall it produce any streaking, discoloration, or blistering of the paint film, determined in accordance with ASTM F502.
- 3.2.6 Effect on Unpainted Surfaces: The product, tested in accordance with ASTM F485, shall neither produce streaking nor leave any stains requiring polishing to remove.
- 3.2.7 Storage Stability: The product 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.
- 3.2.8 Foaming Properties: The product shall remain on unpainted aluminum alloy surfaces not less than 1 min., determined in accordance with 3.2.8.1.
 - 3.2.8.1 Using equipment conforming to MIL-C-81762, the cleaner shall be applied to an unpainted panel of AMS 4049 aluminum alloy, 36 in. (900 mm) square, which has a line scribed 3 in. (75 mm) from the bottom. With the panel held in a horizontal position the cleaner shall be applied from a 6 ft (2 m) foam wand assembly and the foam generator regulated to ensure a minimum live water pressure of 30 psi (207 kPa), air at 40 - 60 psi (276 - 414 kPa), and a cleaner/water ratio at use dilution recommended by the manufacturer. Cover panel completely with foam except for the area below the scribed line. Within 10 sec after application of cleaner, the panel shall be held at an angle approximately 60 deg to the horizontal. When the foam crosses the scribed line, start timing and measure the time required for the first signs of foam dropping off the panel. Also, measure the time required for the foam to completely drop off the panel. Repeat the test twice with a clean dry panel and report the average time.
- 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 furnish certification from the surfactant manufacturer of the percent biodegradability of the surfactants.
- 3.2.10 Performance: The product, when used in accordance with manufacturer's recommendations, shall remove normally accumulated soils from exterior surfaces of aircraft. No visible residue shall remain on any surface tested.
- 3.3 Quality: The cleaner, as received by purchaser, shall be homogenous, 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 such confirmatory testing as he deems 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 plastics (3.2.4), effect on unpainted surfaces (3.2.6), and quality (3.3) 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), hydrogen embrittlement (3.2.2), flash point (3.2.3), effect on painted surfaces (3.2.5), storage stability (3.2.7), foaming properties (3.2.8), biodegradability (3.2.9), 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 the product to a purchaser, when a change in material 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 activity, the contracting officer, or the request for procurement.
- 4.3 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 submitted 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. 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 any change is necessary in ingredients or in manufacturing procedures, the 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 the 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 1529A, manufacturer's identification, lot number, and quantity.
- 4.5.1 A material safety data sheet conforming to AMS 2825 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 for production use. Each request for modification of product formulation shall be accompanied by a revised data sheet for the proposed formulation.
- 4.5.2 The vendor of the cleaner shall supply a certificate of compliance to biodegradability requirements (3.2.9).
- 4.6 Resampling and Retesting: If any sample used in the above tests fails to meet the specified requirements, disposition of the cleaner may be based on the results of testing three additional samples for each original nonconforming sample. Failure of any retest sample to meet the specified requirements shall be cause for rejection of the cleaner represented and no additional testing shall be permitted. Results of all tests shall be reported.