

Submitted for recognition as an American National Standard

**CLEANER FOR EXTERIOR AIRCRAFT SURFACES
Thickened or Gel-Type, Water-Base**

1. SCOPE:

1.1 Form:

This specification covers a thickened, water-base, non-solvent type cleaner in the form of a gel.

1.2 Application:

This cleaner has been used typically for removing soils from exterior surfaces of aircraft, such as landing gears, wheel wells, and flap cavities, but usage is not limited to such applications.

1.3 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 latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

SAE Technical Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

- AMS 2470 Anodic Treatment of Aluminum Alloys, Chromic Acid Process
- AMS 2475 Protective Treatments, Magnesium 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), Solution Heat Treated
- 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 4045 Aluminum Alloy Sheet and Plate, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr, (7075; -T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated
- AMS 4049 Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (Alclad 7075; -T6 Sheet; -T651 Plate), Solution and Precipitation Heat Treated
- AMS 4376 Magnesium Alloy Plate, 3.0Al - 1.0Zn (AZ31B-H26), Cold Rolled and Partially Annealed
- AMS 4911 Titanium Alloy Sheet, Strip, and Plate, 6Al - 4V, Annealed
- MAM 4911 Titanium Alloy Sheet, Strip, and Plate, 6Al - 4V, Annealed
- AMS 5044 Steel Sheet and Strip, 0.15 Carbon, maximum, Half Hard Temper
- AMS 5046 Sheet, Strip, and Plate, Carbon Steel, (SAE 1020 and 1025), Annealed

2.2 ASTM Publications:

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

- ASTM D 93 Flash Point by Pensky-Martens Closed Tester
- ASTM D 471 Rubber Property - Effect of Liquids
- ASTM D 1193 Reagent Water
- ASTM D 1568 Sampling and Chemical Analysis of Alkylbenzene Sulfonates
- ASTM F 483 Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
- ASTM F 484 Stress Grazing of Acrylic Plastics in Contact with Liquid or Semi-Liquid Compounds
- ASTM F 485 Effects of Cleaners on Unpainted Aircraft Surfaces
- ASTM F 502 Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
- ASTM F 519 Mechanical Hydrogen Embrittlement Testing of Plating Processes and Aircraft Maintenance Chemicals
- ASTM F 1080 Determining the Consistency of Viscous Liquids Using a Consistometer
- ASTM F 1104 Preparing Aircraft Cleaning Compounds, Liquid Type, Water Base, for Storage Stability Testing
- ASTM F 1110 Sandwich Corrosion Test
- ASTM F 1111 Corrosion of Low-Embrittling Cadmium Plate by Aircraft Maintenance Chemicals

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-S-7952	Steel, Sheet and Strip, Uncoated, Carbon (1020 and 1025) Aircraft Quality
MIL-P-25690	Plastic, Sheets and Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant
MIL-P-83310	Plastic Sheet, Polycarbonate, Transparent
MIL-STD-2073-1	DOD Materiel, Procedures for Development and Application of Packaging Requirements

3. TECHNICAL REQUIREMENTS:

3.1 Material:

The composition of the cleaner shall be optional with the manufacturer, but should contain water, biodegradable surfactants, emulsifiers, and thickeners to produce a thickened or gel-type product meeting the requirements of 3.2. Cleaner shall not contain aliphatic or aromatic solvents.

3.2 Properties:

Cleaner shall conform to the following requirements; tests shall be performed in accordance with specified test methods on the product supplied in concentrated form:

3.2.1 Consistency: Cleaner shall flow to a point between 13 and 23 centimeters in 10 seconds, determined in accordance with ASTM F 1080.

3.2.2 Corrosion of Metal Surfaces:

3.2.2.1 Sandwich Corrosion: Specimens of AMS 4045 and AMS 4049, after testing in accordance with ASTM F 1110, shall not show a corrosion rating worse than one or worse than that on control panels tested using ASTM D 1193, Type IV, water.

- 3.2.2.2 Total Immersion Corrosion: Cleaner shall neither show evidence of corrosion nor cause a weight change of any test panel greater than shown in Table 1, determined in accordance with ASTM F 483:

TABLE 1 - Maximum Weight Change

Panel	Weight Change mg/cm ² per 24 hours
AMS 4037 Aluminum Alloy, anodized as in AMS 2470	0.3
AMS 4041 Aluminum Alloy	0.3
AMS 4049 Aluminum Alloy	0.3
AMS 4376 Magnesium Alloy, dichromate treated as in AMS 2475	0.2
AMS 4911 or MAM 4911 Titanium Alloy	0.1
AMS 5044 Steel	0.8

- 3.2.2.3 Low-Embrittling Cadmium Plate: Panels coated with low-embrittling cadmium plate shall not show a weight change greater than 0.3 mg/cm² per 24 hours, determined in accordance with ASTM F 1111.
- 3.2.3 Hydrogen Embrittlement: Cleaner shall be non-embrittling, determined in accordance with ASTM F 519, Type 1a, 1c, or 2a.
- 3.2.4 Flash Point: Shall be non-flammable, determined in accordance with ASTM D 93.
- 3.2.5 Effect on Plastics: There shall be no crazing or staining of MIL-P-25690 stretched acrylic plastic or MIL-P-83310 polycarbonate plastics, determined in accordance with ASTM F 484.
- 3.2.6 Effect on Painted Surfaces: Cleaner shall neither produce a decrease in film hardness greater than two pencil hardness levels nor shall it produce any streaking, discoloration, or blistering of the paint film, determined in accordance with ASTM F 502.
- 3.2.7 Effect on Unpainted Surfaces: Cleaner, tested in accordance with ASTM F 485, shall neither produce streaking nor leave any stains requiring polishing to remove.
- 3.2.8 Effect on Natural Rubber: Cleaner shall not produce a change in volume swell of natural rubber greater than 2% after 8 hours immersion, determined in accordance with ASTM D 471.

3.2.9 Stability:

- 3.2.9.1 Heat Stability: Cleaner shall show no separation or stratification at $50\text{ }^{\circ}\text{C} \pm 10$ ($122\text{ }^{\circ}\text{F} \pm 18$), determined in accordance with ASTM F 1104.
- 3.2.9.2 Cold Stability: Cleaner shall show no precipitation, stratification, layering, or separation at $-8\text{ }^{\circ}\text{C} \pm 2$ ($18\text{ }^{\circ}\text{F} \pm 3$), determined in accordance with ASTM F 1104. If product freezes, it shall, on thawing, return to its original state without agitation.
- 3.2.9.3 Accelerated Storage Stability: The cleaner shall exhibit no change in appearance, shall not separate, and shall not cause any visual corrosion of the steel strip, when tested as follows: Polish an AMS 5046 (MIL-S-7952) steel strip, nominally 0.04 x 0.50 x 6.0 inches (1.0 x 12.7 x 152 mm), using 240 grit silicon carbide paper. Clean the specimen using absorbent paper tissue, wiping first with methyl ethyl ketone and then with isopropanol. Dry the specimen, place it in a clean glass pressure bottle, add enough cleaner to cover half of the strip, cap the bottle, roll it on its side to coat the strip, and immerse bottle in a water or oil bath. Program the temperature of the bath for $60\text{ }^{\circ}\text{C} \pm 1$ ($140\text{ }^{\circ}\text{F} \pm 2$) for 8 hours ± 0.25 followed by 16 hours ± 0.5 without heating. After five 24 hour cycles and without agitation, examine the cleaner and the steel strip.
- 3.2.10 Performance: The product, when used in accordance with manufacturer's recommendations, shall remove normally accumulated soils from aircraft landing gears, wheel wells, and flap cavities. No visible residue shall remain on any surface tested.

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 cleaner 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 cleaner conforms to the requirements of this specification.

4.2 Classification of Tests:

- 4.2.1 Acceptance Tests: Tests for effect on plastics (3.2.5) and effect on unpainted surfaces (3.2.7) are acceptance tests and shall be performed on each lot of cleaner.

- 4.2.2 Periodic Tests: Tests for corrosion of metal surfaces (3.2.2), hydrogen embrittlement (3.2.3), flash point (3.2.4), effect on natural rubber (3.2.8), stability (3.2.9), and performance (3.2.10) are periodic tests and shall be performed at a frequency selected by the manufacturer unless frequency of testing is specified by purchaser.
- 4.2.3 Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of cleaner to a purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.
- 4.2.3.1 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, contracting officer, or request for procurement.
- 4.3 Sampling and Testing: Shall be in accordance with all applicable requirements of ASTM D 1568; a lot shall be all cleaner produced in a continuous series of operations from the same batches of ingredients and presented for vendor's inspection at one time. A lot may be packaged in small quantities and delivered under the basic lot approval provided lot identification is maintained.
- 4.3.1 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 and the report of 4.5 shall state that such plan was used.
- 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 ingredients 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:
- The vendor of cleaner shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the cleaner conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 1523, manufacturer's identification, and quantity.