

Cleaner for Aircraft Exterior Surfaces  
Emulsion, Pressure-Spray Type

RATIONALE

This specification was revised to meet current verbiage required by SAE standards with no technical changes.

1. SCOPE

1.1 Form

This specification covers an emulsion-type, low-foaming cleaner in the form of a liquid.

1.2 Application

This cleaner has been used typically for removing soils from painted and unpainted exterior surfaces of aircraft by pressure spray or manual application, 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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org)

AMS2470	Anodic Treatment of Aluminum Alloys, Chromic Acid Process
AMS2475	Protective Treatments, Magnesium Alloys
AMS4037	Aluminum Alloy, Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated

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AMS4041	Aluminum Alloy, Alclad Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn, Alclad 2024 and 1- 1/2% Alclad 2024, -T3 Flat Sheet; 1-1/2% Alclad 2024-T351 Plate
AMS4049	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
AMS4376	Plate, Magnesium Alloy, 3.0Al - 1.0Zn - 0.20Mn (AZ31B-H26), Cold Rolled and Partially Annealed
AMS4911	Titanium Alloy, Sheet, Strip, and Plate, 6Al - 4V, Annealed
AMS5045	Steel, Sheet and Strip, 0.25 Carbon, Maximum, Hard Temper

## 2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, [www.astm.org](http://www.astm.org).

ASTM D 56	Flash Point by Tag Closed Tester
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 Cracking 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 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 the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

MIL-PRF-25690	Plastic, Sheets and Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant
MIL-STD-870	Cadmium Plating, Low Embrittlement, Electrodeposition

## 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 solvents to produce a low-foaming 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; diluent shall be ASTM D 1193, Type IV, water.

#### 3.2.1 Corrosion of Metal Surfaces

##### 3.2.1.1 Sandwich Corrosion

Cleaner shall produce a rating not worse than 1, determined in accordance with ASTM F 1110.

### 3.2.1.2 Total Immersion Corrosion

The product shall neither cause evidence of corrosion of the panels nor a weight change of any test panel greater than that shown in Table 1, determined in accordance with ASTM F 483:

TABLE 1 - MAXIMUM IMMERSION WEIGHT CHANGE

Test Panel Material	Weight Change mg/cm <sup>2</sup> per 24 hours
AMS4037 Aluminum Alloy, anodized as in AMS2470	0.3
AMS4041 Aluminum Alloy (optional)	0.3
AMS4049 Aluminum Alloy	0.3
AMS4376 Magnesium Alloy, dichromate treated as in AMS2475	0.2
AMS4911 Titanium Alloy	0.1
AMS5045 Carbon Steel	0.8

### 3.2.1.3 Low-Embrittling Cadmium Plate

Panels coated with low-embrittling cadmium plate shall show a weight change not greater than 0.3 mg/cm<sup>2</sup> per 24 hours, determined in accordance with ASTM F 1111.

### 3.2.2 Hydrogen Embrittlement

The product shall be non-embrittling, determined in accordance with ASTM F 519, utilizing Type 1a, 1c, or 2a specimens, cadmium plated in accordance with MIL-STD-870, Class 1, Type I. Type 1a and 1c specimens shall be loaded to 45% of the predetermined notch fracture strength, and Type 2a specimens loaded to 80% of the yield strength. The entire 2a stressed specimen, or just the notched area of the 1a and 1c stressed specimen, shall be immersed continuously in the solution under test for 150 hours at a temperature between 68 to 86 °F (20 to 30 °C).

### 3.2.3 Flash Point

Shall be not lower than 140 °F (60 °C), determined in accordance with ASTM D 56.

### 3.2.4 Effect on Plastics

There shall be no crazing or staining of stretched MIL-PRF-25690 plastic, determined in accordance with ASTM F 484.

### 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 F 502.

### 3.2.6 Effect on Unpainted Surfaces

The product, tested in accordance with ASTM F 485, 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 ASTM D 1193, Type IV, water, determined in accordance with ASTM F 1104.

### 3.2.8 Emulsion Stability

Place 20 mL of undiluted cleaning compound into a 100 mL glass-stoppered graduated cylinder and slowly add 80 mL of ASTM D 1193, Type IV, water. Allow to stand for 1 minute. Insert stopper, invert the cylinder twice, and place on a level surface; a homogeneous emulsion should be formed. If not, the product is not acceptable. If the water/product emulsion is satisfactory, allow to stand undisturbed for 1 hour and inspect for separation layer between water phase and solvent phase. If any phase is evident, report this in milliliters. Shake the sample by inverting the cylinder through 20 inversions in less than 10 seconds. Allow to remain undisturbed for 48 hours and reinspect for phase separation. Report phase separation in milliliters. Any separation beyond 5 mL is not acceptable.

### 3.2.9 Performance

The product, 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. Standards for acceptance shall be as agreed upon by purchaser and vendor.

### 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 the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the cleaner conforms to specified requirements.

### 4.2 Classification of Tests

#### 4.2.1 Acceptance Tests

Effect on plastics (3.2.4), effect on unpainted surfaces (3.2.6), and quality (3.3) are acceptance tests and shall be performed on each lot.

#### 4.2.2 Periodic Tests

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), emulsion stability (3.2.8), and performance (3.2.9) are 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

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.

### 4.3 Sampling and Testing

Shall be in accordance with ASTM D 1568; 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.