AEROSPACE MATERIAL SPECIFICATION

AMS1476™	REV. C

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Superseding AMS1476B

(R) Deodorant, Aircraft Toilet

RATIONALE

Changes in this revision include format/editorial changes as well update to specification revisions.

1. SCOPE

1.1 Form

This specification covers a biodegradable deodorant in the form of a liquid concentrate, solid, or gel.

1.2 Application

This deodorant has been used typically as an additive in aircraft toilet systems to control odor, color, and corrosion.

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 +1 724-776-4970 (outside USA), www.sae.org.

AMS4049	Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr, (Alclad 7075; -T6 Sheet, -T65l Plate), Solution and Precipitation Heat Treated
AMS-P-83310	Plastic Sheet, Polycarbonate, Transparent

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
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SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS1476C

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.

ASTM D56 Standard Test Method for Flash Point by Tag Closed Cup Tester

ASTM D445 Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

ASTM D471 Standard Test Method for Rubber Property - Effect of Liquids

ASTM D1193 Standard Specification for Reagent Water

ASTM D1331 Standard Test Methods for Surface and Interfacial Tension of Solutions of Surface-Active Agents

ASTM D1568 Standard Test Methods for Sampling and Chemical Analysis of Alkylbenzene Sulfonates

ASTM E70 Standard Test Method for pH of Aqueous Solutions with the Glass Electrode

ASTM F483 Standard Practice for Total Immersion Corrosion Test for Aircraft Maintenance Chemicals

ASTM F484 Standard Test Method for Stress Crazing of Acrylic Plastics in Contact with Liquid or Semi-Liquid Compounds

ASTM F485 Standard Practice for Effects of Cleaners on Unpainted Aircraft Surfaces

ASTM F502 Standard Test Method for Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces

ASTM F1110 Standard Test Method for Sandwich Corrosion Test

2.3 APHA Publications

Available from American Public Health Association, 1015 Eighteenth Street, N.W., Washington, DC 20036.

Standard Methods for the Examination of Water and Waste Water

2.4 ANSI Accredited Publications

ANSI Z400.1/Z129.1-2010 Hazardous Workplace Chemicals - Hazard Evaluation and Safety Data Sheet and Precautionary Labeling Preparation

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall consist of a biodegradable material with suitable additives, such as deodorants, buffers, etc., necessary to provide a deodorant meeting the requirements of 3.2.

3.1.1 The deodorant shall be free of soaps; non-ionic, cationic, anionic, and amphoteric detergents are acceptable provided the deodorant contains adequate foam depressors to comply with 3.2.2.2.1.

3.1.2 The deodorant shall dilute readily with water with minimum agitation.

3.2 Properties

The deodorant shall conform to the following requirements; tests shall be performed in accordance with specified test methods.

3.2.1 Deodorant As Received in Concentrate Form

Shall be tested as the liquid concentrate, except that if the deodorant is received in the form of a solid or gel, it shall be dissolved at the ratio of 1 part by weight deodorant to 5 parts ASTM D1193, Type IV, water. If a residue (undissolved) is present, filter through a #40 filter paper prior to using for tests. However, such solids should be soluble at intended use dilution.

3.2.1.1 Flash Point

Shall be not lower than 93 °C (199 °F), determined in accordance with ASTM D56.

3.2.1.2 Color

The deodorant shall exhibit a deep blue color to mask organic waste and indicate a chemically-charged toilet. The dye shall be pH stable and shall not break down when tested for 72 hours ± 1 hour in a water solution having a pH of 3 to 11. Formic acid and sodium hydroxide shall be used for adjusting the pH of water solution.

3.2.1.3 Storage Stability

The deodorant shall be stable after storage at room temperature for not less than 12 months. The deodorant shall, if supplied as a liquid concentrate, show no evidence of layering or separation and shall contain no lumps or show evidence of skin formation after being subjected to five freeze-thaw cycles as in 3.2.1.3.1.

3.2.1.3.1 Two 6 ounce (175 mL) samples of deodorant shall be placed in two 8 ounce (250 mL) clear glass bottles or in ziplock-type plastic bags, sealed, and exposed for 8 hours ± 0.25 hour to -23 °C (-9 °F), or lower if necessary to completely freeze the deodorant samples. At the end of the freezing period, the samples shall be removed to a room temperature environment and allowed to thaw for 16 hours ± 0.5 hour. This shall constitute one complete freeze-thaw cycle. The samples shall be subjected to five complete freeze-thaw cycles. At the end of the fifth cycle, the samples shall be examined for conformity to 3.2.1.3.

3.2.1.4 Environmental Properties

Standards vary from area to area and, therefore, acceptance standards for the following environmental properties shall be as agreed upon by purchaser and vendor:

3.2.1.4.1 Biodegradability

Biodegradability of the surfactants used in the deodorant shall be certified by the manufacturer.

3.2.1.4.2 Total Alkalinity or Acidity

Shall be determined as ppm CaCO3 in accordance with APHA Method 2320.

3.2.1.4.3 Chemical Oxygen Demand

Shall be determined in accordance with APHA Method 5220, using the dichromate reflux procedure.

3.2.1.4.4 Biological Oxygen Demand

The five-day biological oxygen demand at 20 °C (68 °F) shall be determined in accordance with APHA Method 5210, using filtered raw sewage seed.

3.2.1.4.5 Total Inorganic Phosphate

Shall be determined in accordance with APHA Method 4500-P, stannous chloride procedure, or Method 3120, using plasma emission spectroscopy.

3.2.1.4.6 Phenols

Shall be determined by distilling 500 mL of the deodorant in accordance with APHA Method 5530, followed by chloroform extraction in accordance with APHA Method 5530.

3.2.1.4.7 Heavy Metals

Chromium, copper, cadmium, mercury, nickel, silver, and zinc contents shall be determined in accordance with APHA Method 3120.

3.2.2 Deodorant in Diluted Form

Shall be as follows, determined on deodorant diluted to prime charge (see 8.2) with ASTM D1193, Type IV, water.

3.2.2.1 Viscosity

Shall not exceed by more than 10% the viscosity of ASTM D1193, Type IV, water at 10 °C (50 °F) and 30 °C (86 °F), determined in accordance with ASTM D445.

3.2.2.2 Foam Volume

Shall not exceed 5 mL after testing in accordance with 3.2.2.2.1.

3.2.2.2.1 100 mL of the deodorant shall be put into a stoppered 250 mL graduated cylinder and inverted 10 times in 15 seconds and the initial foam volume recorded; after standing undisturbed for 150 seconds ± 1 second, the foam volume shall again be measured and recorded. The second reading shall not exceed 5 milliliters.

3.2.2.3 Surface Tension

The deodorant shall have wetting characteristics such that it reduces the surface tension of water to a minimum of 10% below that of ASTM D1193, Type IV, diluent water, determined in accordance with ASTM D1331 at 25 °C ± 3 °C (77 °F ± 5 °F).

3.2.2.4 Waste Material Reactivity

The deodorant shall mask color and odor of human waste materials. A green-blue color and an odor which remains slightly perfumed, never offensive or overpowering, shall be retained after testing as in 3.2.2.4.1.

3.2.2.4.1 To 1 pint (473 mL) of deodorant shall be added 1 pint (473 mL) of raw sewage (the raw sewage shall be made up of 120 grams of fresh feces and 825 mL fresh urine thoroughly mixed in a Waring blender, or similar high speed mixing device). A 1 gallon container or a 5 L beaker is suitable for this purpose. The resultant mixture shall be agitated for 5 minutes using a 1 inch (25 mm) diameter 3-bladed propeller-type stirrer running at 1000 rpm ± 100 rpm. The remaining urine/feces mixture shall be diluted with an equal volume of water and retained for use as the control sample when evaluating the odor of the deodorant/waste mixture as in 3.2.2.4.2.

3.2.2.4.2 After a lapse of eight hours, the odor of the control sample shall be rated as 4+; the deodorant/waste shall have a rating of 2+ or less and shall be rated as follows:

4+ = Very strong odor of sewage

3+ = Strong odor of sewage

2+ = Moderate odor of sewage (deodorant detectable; slightly perfumed; not offensive or overpowering odor of sewage)

1+ = Slight odor of sewage (deodorant noticeable)

0 = No detectable odor of sewage (deodorant predominant)

3.2.3 Deodorant tested both as concentrate as defined in 3.2.1 and in diluted form as defined in 8.2, except where indicated:

3.2.3.1 pH:

Shall be determined in accordance with ASTM E70 and reported.

3.2.3.2 Effect on Unpainted Surfaces

There shall be no visible stains or residue on test panels, tested in accordance with ASTM F485.

3.2.3.3 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.

3.2.3.4 Effect on Metallic Surfaces

3.2.3.4.1 Sandwich Corrosion

Specimens of AMS4049 aluminum alloy, after testing in accordance with ASTM F1110, shall show no evidence of corrosion worse than specimen panels tested in ASTM D1193, Type IV, water.

3.2.3.4.2 Total Immersion Corrosion

The deodorant shall neither show evidence of corrosion of the panels nor cause a weight change greater than 0.3 mg/cm2 per 24 hours for any panel of AMS4049 aluminum alloy, determined in accordance with ASTM F483.

3.2.3.5 Temperature Stability

The deodorant shall show no chemical or physical deterioration, including evidence of discoloration, layering, skinning, or other change denoting loss of stability, after being exposed for 120 hours ± 1 hour to 2 °C ± 2 °C (36 °F ± 4 °F) and to 50 °C ± 5 °C (122 °F ± 9 °F).

3.2.3.6 Fabric Stain Test

The deodorant shall not stain 2 x 2 inch (51 x 51 mm) samples of white 100% cotton, light-colored nylon, and light-colored wool when spotted with the deodorant. The spotted fabric samples shall be allowed to dry at 60 °C ± 3 °C (140 °F ± 5 °F), washed with a commercial detergent, rinsed, and dried. The presence of any stain remaining on any of the three types of fabric shall be reported.

3.2.3.7 Solubility

The deodorant shall be fully soluble in both hard and soft water and shall produce no detectable precipitate, determined in accordance with 3.2.3.7.1.

3.2.3.7.1 One set of two samples of the deodorant shall be diluted in accordance with 3.2.2; the other sample shall be diluted using 20 grain hard water solution made up by dissolving 0.40 gram ± 0.005 gram of analytical reagent calcium acetate ($Ca(C_2H_30_2)_2{\cdot}H_20$) and 0.28 gram ± 0.005 gram of analytical reagent magnesium sulfate ($MgSO_4{\cdot}7H_20$) in one liter of boiling ASTM D1193, Type IV, water. After stirring vigorously for not less than one minute, both samples shall be allowed to stand undisturbed for 15 minutes ± 1 minute, and examined for evidence of precipitation.

3.2.3.8 Effect on Rubber and Plastic Materials

The deodorant, diluted in accordance with 3.2.2, shall neither cause swelling greater than 10%, determined in accordance with ASTM D471, nor cause staining, discoloration, or evidence of degradation of rubber or plastic materials normally incorporated in aircraft lavatory systems. Materials listed in 3.2.3.8.1 shall be tested in accordance with 3.2.3.8.2. When specified by purchaser, tests to determine changes in tensile strength and elongation shall be performed in accordance with ASTM D471 and the results obtained on exposed specimens shall be not lower than 75% of the tensile strength and elongation values determined on unexposed specimens.

3.2.3.8.1 Test specimens shall be composed of ethylene propylene (EPM), fluorosilicone (FVMQ), methyl-phenyl-silicone (PMQ), chloroprene (CR), acrylonitrile butadiene (NBR), and fluorocarbon (FKM) rubbers; of acetal, polysulfone, nylon, and polycarbonate plastics; of epoxy-glass fabric laminates; and of glass fabric.

3.2.3.8.2 Duplicate strips of each material listed in 3.2.3.8.1 shall be placed in test tubes containing the deodorant. Strips for determining volume change shall be totally immersed. Strips for determination of staining, discoloration, and evidence of degradation shall be partially immersed so that the bottom-half is in the deodorant and the top-half is in air. The test tubes shall be capped and stored at ambient temperature for 30 days. After this exposure, the immersed and non-immersed area of each of the partially immersed specimens shall be compared visually for evidence of staining, discoloration, or degradation and the results noted. Volume change shall be determined on the totally-immersed specimens and the values compared with those of untreated samples from the same source. Any change in volume shall be reported.

3.2.3.8.3 Effect on Polycarbonate Plastics

Deodorant, diluted in accordance with 3.2.2, shall not craze, stain, or discolor AMS-P-83310 polycarbonate plastic, determined in accordance with test procedures specified in ASTM F484 on specimens stressed for 30 minutes ± 2 minutes to an outer fiber stress of 2000 psi (13.8 MPa).

3.2.3.9 Miscibility

The deodorant shall be miscible in mixtures of water and either ethylene glycol or propylene glycol. A solution made up in accordance with 3.2.2, except that 50% of the diluent water shall be replaced with either ethylene glycol or propylene glycol, shall show complete stability after storage for 7 days at 24 °C ± 3 °C (75 °F ± 5 °F).

3.3 Quality

The product, as received by purchaser, shall be homogeneous, free from skins and lumps, and uniformly blue in color, with a faint, pleasant, perfume odor.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of the deodorant 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 deodorant conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Flash point (3.2.1.1) and color (3.2.1.2) of the deodorant in concentrated form and foam volume (3.2.2.2) and pH (3.2.3.1) of the deodorant in diluted form are acceptance tests and shall be performed on each lot.