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400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 1427A

Issued OCT 1981
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Submitted for recognition as an American National Standard

Superseding AMS 1427

DEICING/ANTI-ICING FLUID, AIRCRAFT
Propylene Glycol Base

This specification has been declared “NONCURRENT” by the Aerospace Materials Division, SAE, as of January 1995. It is recommended, therefore, that this specification not be specified for new designs.

This cover sheet should be attached to the original issue of the subject specification.

"NONCURRENT” refers to those materials which have previously been widely used and which may be required on some existing designs in the future. The Aerospace Materials Division, however, does not recommend these as standard materials for future use in new designs. Each of these “NONCURRENT” specifications is available from SAE upon request.

PREPARED UNDER THE JURISDICTION OF AMS COMMITTEE “J” (AMCM)

AN AMERICAN NATIONAL STANDARD

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AMS1427

Issued 10-1-81
Revised

DEICING/ANTI-ICING FLUID, AIRCRAFT
Propylene Glycol Base

REAFFIRMED
MAR 1992

1. SCOPE:

1.1 Form: This specification covers a propylene-glycol base, deicing/anti-icing fluid in the form of a concentrated liquid.

1.2 Application: Primarily for prevention and removal of frost and ice deposits on external surfaces of aircraft at airfields where ethylene glycol is not permitted.

1.3 Precaution:

1.3.1 The deicing and anti-icing formulation supplied under requirements of this specification may be mildly irritating and contact with human skin and eyes should be avoided.

1.3.2 Although the fluid has a minimum flash point requirement of 100°C (212°F), it should be used with extreme care when applied around heaters or engine exhaust.

1.3.3 Caution should be exercised in the use of glycol-water deicing/anti-icing solutions in and around aircraft having silver or silver-coated electrical/electronic circuitry. Dehydrolysis reactions which result in fire have been reported when such glycol-water solutions contact silver or silver-coated circuits, such as defectively insulated wiring, switches, and circuit breakers, which are conducting direct current.

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 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.OA1 - 1.0Zn (AZ31B-H26)
AMS 4911 - Titanium Alloy Sheet, Strip and Plate (6A1 - 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

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 D93 - Flash Point by Pensky-Martens Closed Tester
ASTM D97 - Pour Point of Petroleum Oils
ASTM D270 - Sampling Petroleum and Petroleum Products
ASTM D445 - Kinematic Viscosity of Transparent and Opague Liquids (and the Calculation of Dynamic Viscosity)
ASTM D891 - Specific Gravity of Industrial Aromatic Hydrocarbons and Related Materials
ASTM D1568 - Sampling and Chemical Analysis of Alkylbenzene Sulfonates
ASTM D3278 - Flash Point of Liquids by Setaflash Closed Tester
ASTM E70 - pH of Aqueous Solutions with the Glass Electrode
ASTM F483 - Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
ASTM F484 - Stress Crazing of Acrylic Plastics in Contact with Liquid and Semi-Liquid Compounds
ASTM F485 - Effects of Cleaners on Unpainted Aircraft Surfaces
ASTM F502 - Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
ASTM F503 - Preparing Aircraft Cleaning Compounds, Liquid Type, for Storage Stability Testing
ASTM F519 - Hydrogen Embrittlement Testing of Aerospace Materials
ASTM G30 - Making and Using U-Bend Stress Corrosion Test Specimens

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 191204

2.3.1 Federal Specifications:

QQ-Q-250/4 - Aluminum Alloy 2024, Plate and Sheet
QQ-A-250/5 - Aluminum Alloy Alclad 2024, Plate and Sheet
QQ-A&250/13 - Aluminum Alloy Alclad 7075, Plate and Sheet
QQ-M-44 - Magnesium Alloy Plate and Sheet (AZ31B)
QQ-S-698 - Steel, Sheet and Strip, Low Carbon

2.3.2 Military Specification:

MIL-T-9046 - Titanium and Titanium Alloy, Sheet, Strip and Plate
MIL-P-25690 - Plastic, Sheet and Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant

2.3.3 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Material: The composition of the fluid shall be a propylene-glycol base and shall otherwise be optional with the manufacturer, but shall contain additives, such as inhibitors, producing a product meeting the requirements of 3.2. The product shall not contain ethylene-glycol but may contain color dyes as agreed upon by purchaser and manufacturer.

3.2 Properties: The fluid shall conform to the following requirements; tests shall be performed in accordance with specified test methods:

3.2.1 Fluid As-Received in Concentrated Form: Shall be as follows:

3.2.1.1 Flash point: Shall be not lower than 100°C (212°F), determined in accordance with ASTM D56, ASTM D93, or ASTM D3278. In case of dispute, flash point determined in accordance with ASTM D56 shall apply.

3.2.1.2 Specific Gravity: Shall be within + 0.015 units of the preproduction value established as in 4.4.1,determined in accordance with ASTM D891.

3.2.1.3 Storage Stability: The fluid, tested in accordance with ASTM F503, shall neither show separation from exposure to heat or cold nor show an increase in turbidity greater than a freshly-made control sample diluted 1:1 with distilled water. The hot test shall be conducted at 90°C + 5 (194°F±9) for 30 days. The cold test shall be conducted-for 30 days.

3.2.1.4 Color: The fluid shall be colored red-orange, unless otherwise specified by purchaser. Color shall not exceed that of a sample of fluid containing 100 ppm OrasoI Orange RLN, C. I. Solvent Orange 59.

3.2.2 Fluid Tested Both as a Concentrate and in Diluted Solution: Shall be as follows, determined on the fluid as received and on a solution of the concentrated fluid diluted 1:1 with distilled water, except as specified in 3.2.2.4.4.

3.2.2.1 pH: Shall be within ± 0.5 units of the preproduction value established as in 4.4.1, determined in accordance with ASTM E70.

3.2.2.2 Pour Point: Shall be not greater than +6°C (+10°F) from the preproduction value established as in 4.4.1, determined in accordance with ASTM D97.

3.2.2.3 Viscosity: Shall be within + 5% of the preproduction values at -10°C (14°F), 0°C (32°F), and 50°C (122°F) established as in 4.4.1 for maximum and minimum values, determined in accordance with ASTM D445.

3.2.2.4 Corrosion of Metal Surfaces:

3.2.2.4.1 Sandwich Corrosion: Specimens, after test, shall show a rating not worse than 1, determined in accordance with ARP 1512.

3.2.2.4.2 Total Immersion Corrosion: The fluid shall neither show evidence of corrosion nor cause a weight change of any single test panel greater than the following, determined in accordance with ASTM F483:

Test Panel	Weight Change (mg/cm2)/24 hr
AMS 4037 or QQ-A-250/4 Aluminum Alloy, anodized as in AMS 2470	0.3
AMS 4041 or QQ-A-250/5 Aluminum Alloy (Optional)	0.3
AMS 4049 or QQ-A-250/13 Aluminum Alloy	0.3
AMS 4376 or QQ-M-44, Alloy AZ31B, Magnesium Alloy, dichromate treated as in AMS 2475	0.2
AMS 4911 or MIL-T-9046, Type III, Composition C, Titanium Alloy	0.1
ASTM A109, Temper No. 1, or QQ-S-698, Condition 1, Carbon Steel	0.8

3.2.2.4.3 Low-Embrittling Cadmium Plate: Test panels coated with low-embrittling cadmium plate shall not show a weight change greater than 0.3 (mg/cm2)/24 hr, determined in accordance with ARP 1511.

3.2.2.4.4 Stress-Corrosion Resistance: The fluid shall not cause cracks in AMS 4911 titanium alloy, determined in accordance with ASTM G30 using U-bend specimens in accordance with ASTM G30, Example 1. The 3-in. (75-mm) dimension of the specimen shall be parallel to the direction of rolling (longitudinal). Specimens shall be stressed in two steps. First stage stressing shall be by brake forming over a 0.28 in. (7 mm) mandrel in one pass to 65 deg ± 5. Six test specimens shall be exposed to the test fluid; 3 specimens exposed to diluted fluid and three specimens to concentrated fluid. Specimens shall be immersed in the test fluid, withdrawn, air dried, heated for 8 hr ± 0.25 at 425°C ± 5 (800°F ± 9), cooled to room temperature, and examined at 20X magnification for cracks. Two control specimens shall be similarly tested without exposure to the test fluid.

3.2.2.5 Hydrogen Embrittlement: The fluid shall be non-embrittling, determined in accordance with ASTM F519, Type la, lc, or 2a.

3.2.2.6 Effect on Plastic: The fluid shall not craze, stain, or discolor MIL-P-25690 stretched acrylic plastic, determined in accordance with ASTM F484.

3.2.2.7 Effect on Painted Surfaces: The fluid, heated to 65°C ± 5 (150°F±10), shall neither decrease the paint film hardness 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.

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

3.2.3 Performance: The fluid, used in accordance with manufacturer's recommendations, shall remove normally accumulated frozen deposits of frost and ice from the exterior surfaces of parked aircraft and shall provide protection against re-freezing for up to 1 hour.

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

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the fluid 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 fluid conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for flash point (3.2.1.1), specific gravity (3.2.1.2), color (3.2.1.4), and pH (3.2.2.1) are classified as acceptance tests and shall be performed on each lot of fluid.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for pour point (3.2.2.2), viscosity (3.2.2.3), corrosion of metal surfaces (3.2.2.4), hydrogen embrittlement (3.2.2.5), effect on plastic (3.2.2.6), effect on painted surfaces (3.2.2.7), effect on unpainted surfaces (3.2.2.8), and performance (3.2.3) 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 Reproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the initial shipment of fluid 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, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be in accordance with all applicable requirements of the following; a lot shall be all fluid produced in one continuous manufacturing operation from the same batches of raw materials and presented for vendor's inspection at one time:

4.3.1 Drum Shipments: ASTM D1568.

4.3.2 Bulk Shipments: ASTM D270.

4.4 Approval:

4.4.1 Sample fluid shall be approved by purchaser before fluid for production use is supplied, unless such approval be waived. Results of tests.on production fluid 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 fluid which are essentially the same as those used on the approved sample fluid. 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 or processing and when requested, sample fluid. Production fluid made by the revised procedure shall not be shipped prior to receipt of reapproval.