SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS3151 | REV. C

Issued 1983-07
Revised 2001-03
Reaffirmed 2006-04
Cancelled 2009-10

Superseding AMS3151B

Fluid, Aircraft Compass

RATIONALE

AMS3151 has been designated Cancelled.

CANCELLATION NOTICE

This specification has been declared “CANCELLED” by the Aerospace Materials Division, SAE, as of October 2009. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications indicating that it has been “CANCELLED”.

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1. SCOPE:

1.1 Form:

This specification covers one grade of hydrocarbon compass fluid.

1.2 Application:

This product has been used typically for use as a filling medium for magnetic compasses.

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 canceled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 56	Flash Point by Tag Closed Tester
ASTM D 86	Distillation of Petroleum Products
ASTM D 130	Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test
ASTM D 156	Saybolt Color of Petroleum Products (Saybolt Chromometer Method)
ASTM D 445	Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
ASTM D 1093	Acidity of Distillation Residues or Hydrocarbon Liquids
ASTM D 1319	Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption

3. TECHNICAL REQUIREMENTS:

3.1 Material:

The fluid shall be a refined fraction of crude petroleum without admixtures of other compounds not naturally occurring in crude petroleum.

3.2 Properties:

The fluid shall conform to the following requirements, determined in accordance with specified test methods, insofar as practicable:

3.2.1 Color: Shall be water white, not darker than No. 25 Saybolt, determined in accordance with ASTM D 156.

3.2.2 Flash Point: Shall be not lower than 32 °C (90 °F), determined in accordance with ASTM D 56.

3.2.3 Distillation: Upon distillation, the fluid end point shall not exceed 260 °C (500 °F), determined in accordance with ASTM D 86.

3.2.4 Corrosion: Shall be not greater than Class 1, determined in accordance with ASTM D 130 at 100 °C ± 1 (212 °F ± 2).

3.2.5 Aromatics: Fluid shall contain not more than 10% by volume of aromatics, determined in accordance with ASTM D 1319.

3.2.6 Viscosity: Shall be as shown in Table 1, determined in accordance with ASTM D 445:

TABLE 1 - Viscosity

Temperature ±1 °C (±2 °F)	Value, centistokes (mm^2/s)
38 °C (100 °F)	0.90 to 1.15
0 °C (32 °F)	2.30 maximum

3.2.7 Cloudiness and Freeze Point: The fluid shall not gel, crystallize, or solidify when tested in accordance with 4.5.1. In addition, at the completion of the test outlined in 4.5.1, turbidity or haze shall not exceed that exhibited by the turbidity standard described in 4.5.1.1.

3.2.8 Light Stability: No precipitate shall be visible in the fluid after completion of the light stability test in 4.5.2 and the color shall be not darker than No. 21 Saybolt, determined in accordance with ASTM D 156.

3.2.9 Oxygen Stability: No precipitate shall be visible in the fluid after completion of the oxidation stability test in 4.5.3 and the color of the fluid shall be not darker than No. 21 Saybolt, determined in accordance with ASTM D 156.

3.2.10 Fluorescence: The fluorescence of the fluid shall not exceed 1.0 microlambert, determined in accordance with 4.5.4.

3.2.11 Neutrality: After completion of the oxygen stability test of 3.2.9, the residual fluid shall exhibit a neutral reaction, determined in accordance with ASTM D 1093.

3.3 Quality:

The fluid, as received by purchaser, shall be uniform in quality, free of undissolved water, sediment, or suspended matter, and free from foreign materials and other contaminants detrimental to usage of the fluid. Substances known to be toxic under normal conditions of handling shall not be present.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of fluid 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 fluid conforms to the requirements of this specification.

4.2 Classification of Tests:

All technical requirements are acceptance tests and preproduction tests and shall be performed prior to or on the initial shipment of fluid to a purchaser, on each lot, 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:

Sufficient fluid shall be taken at random from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1 A lot shall be all fluid 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 and shall not exceed 1000 gallons (3785 L).

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 by purchaser. 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 ingredients and/or processing and, when requested, sample fluid. Production fluid made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

4.5.1 Cloudiness and Freeze Point:

4.5.1.1 Turbidity Standard: 25 mL of a 0.00322 molar solution of barium chloride shall be measured into a 250 mL volumetric flask. Add 200 mL of distilled water and 25 mL of 0.50 normal sulfuric acid. Shake the solution well to ensure complete precipitation of the barium sulfate. Pour the resultant suspension into a small bottle and seal. The turbidity standard shall be used within 30 minutes of preparation.

4.5.1.2 Specimen Preparation: Place a clean four ounce (118 mL) bottle in an oven and condition for not less than 24 hours at 100 °C ± 3 (212 °F ± 5). Place not less than three fluid ounces (89 mL) of the fluid to be tested in the dried bottle and stopper tightly.

4.5.1.3 Test Procedure: Place the bottle containing the fluid sample in a cold chamber maintained at -55 °C (-67 °F) or lower temperature and hold for 30 minutes ± 1.

4.5.1.4 Examination of Specimen: After the prescribed time of low-temperature conditioning, the specimen shall be removed from the cold chamber and immediately shaken for approximately ten seconds.

4.5.1.4.1 There shall be no visual evidence of gelling, crystallization, or solidification of the fluid. Turbidity of the fluid shall not exceed that of the standard prepared in accordance with 4.5.1.1. The turbidity standard shall be shaken vigorously within five minutes of the time it is used for making comparisons.

4.5.1.4.2 If frost formation on the specimen bottle interferes with the turbidity comparison or other visual determination, the bottle may be quickly dipped in a 1:1 mixture, by volume, of glycerine and methyl alcohol which has previously been cooled and held at the test temperature.

4.5.1.4.3 The fluid evaluation shall be completed within one minute after the specimen is removed from the cold chamber.

4.5.2 Light Stability: Fill a test tube, approximately 1 inch (25 mm) OD and 4 inches (102 mm) long, with the fluid. Expose the tube containing the fluid to the light of a 13-ampere carbon arc lamp using Fad-O-Meter No. 70 or No. 20 carbons, or equivalent, enclosed in a Corex D or equivalent globe. Place the tube containing the fluid sample in a vertical position in approximately the same horizontal plane with the arc at a distance of one foot (305 mm) from the arc. Color determination shall be made after 18 hours of exposure.

4.5.3 Oxidation Stability: A suitable glass container, such as an oil sample bottle, shall be nearly filled with the fluid. Place the bottle containing the fluid to be tested in a suitable metal bomb having a capacity about 1-1/2 times the external volume of the test specimen container. Seal the bomb, test for leaks, purge, and back fill with oxygen to a pressure of 95 to 100 psi (655 to 689 kPa). Place the bomb in a temperature chamber maintained at 95 to 100 °C (203 to 212 °F) and hold at heat for 6 to 6.5 hours. Cool the bomb rapidly in room temperature water with the charging valve still closed. Release the pressure slowly, open the bomb, and remove the specimen from the container to permit examination of the fluid.

4.5.4 Fluorescence: An illuminometer or similar low brightness photometer of equivalent precision shall be used for the brightness measurement. The fluid sample shall be placed in an absorption cell, having a light path through the liquid of 10 mm and a 32-mm ID. The glass used in the cell shall be nonfluorescing. The brightness shall be measured at an angle of 45 degrees to the plane of the flat surface of the absorption cell. The illumination shall be incident at an angle of 45 degrees to the flat surface of the absorption cell and shall approach the sample at right angles to the direction of observation. A non-fluorescing white paper backing may be used behind the cell to create better field uniformity. The specimen shall be excited in this position with ultraviolet light of 365 millimicrons (nm) wavelength until it reaches a constant brightness. The intensity of the excitation lamp and specimen shall be determined with the aid of a reference precalibrated plaque. The brightness calibration method shall be acceptable to the purchaser.