

JET REFERENCE FLUID

1. SCOPE:

1.1 Form: This specification covers a mixture of liquid hydrocarbons and soluble additives.

1.2 Application: To provide a standard composition, simulating aviation jet engine fluid, to be used in laboratory tests involving compatibility and interactions with aircraft materials.

1.3 Classification: Jet reference fluid shall be classified as follows:

Type I - Liquid hydrocarbons without the addition of metal ions. Type I fluid is intended for use for materials compatibility tests except sealant chalking characteristics.

Type II - Liquid hydrocarbons with a controlled concentration of metal ions. Type II fluid is intended for use for sealant chalking tests.

1.3.1 Type I shall be supplied unless Type II is ordered.

1.4 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 documents shall be as specified in AMS 2350.

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 particular infringement arising therefrom, is the sole responsibility of the user."

AMS documents are protected under United States and international copyright laws. Reproduction of these documents by any means is strictly prohibited without the written consent of the publisher.

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 2825 - Material Safety Data Sheets

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

ASTM D130 - Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test
ASTM D156 - Saybolt Color Of Petroleum Products (Saybolt Chromometer Method)
ASTM D664 - Neutralization Number by Potentiometric Titration
ASTM D1266 - Sulfur in Petroleum Products (Lamp Method)
ASTM D3227 - Mercaptan Sulfur in Gasoline, Kerosine, Aviation Turbine, and Distillate Fuels (Potentiometric Method)

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Specifications:

TT-S-735 - Standard Test Fluids, Hydrocarbon
TT-T-548 - Toluene (Technical)

2.3.2 Federal Standards:

FED-STD-791 - Lubricant, Liquid Fuel, and Related Products, Methods of Testing

2.3.3 Military Standards:

MIL-STD-290 - Packaging, Packing and Marking of Petroleum Products

3. TECHNICAL REQUIREMENTS:

3.1 Material:

- 3.1.1 Type I fluid shall conform to the following composition, determined by wet chemical methods, by chromatographic or spectrographic procedures, or by other analytical methods acceptable to purchaser:

Toluene (TT-T-548)	28% $\pm$ 1 volume
Cyclohexane (Technical)	34% $\pm$ 1 volume
Isooctane (TT-S-735, Type I)	38% $\pm$ 1 volume
Tertiary dibutyl disulfide (doctor sweet)	1% $\pm$ 0.005 volume
Tertiary butyl mercaptan	0.015% $\pm$ 0.0015 by weight of the other four components

- 3.1.1.1 The fluid blend shall contain 0.400% $\pm$ 0.005 by weight total sulfur and 0.0050% $\pm$ 0.0005 by weight mercaptan sulfur determined in accordance with ASTM D1266 and ASTM D3227, respectively.
- 3.1.1.2 The fluid shall be stored out of contact with light in containers which are inert to the fluid ingredients (See 5.1.1). If not used within 90 days after blending, the fluid shall be retested for mercaptan and total sulfur content.
- 3.1.2 Type II fluid shall be produced by blending the individual components of Type I fluid in amber glass containers and then adding 0.50 ppm by weight of copper and cadmium ions.
- 3.1.2.1 Prior to blending in the copper and cadmium ions, the admixture shall contain less than 0.05 ppm by weight copper or cadmium, determined by wet chemical methods or by spectrographic procedures designed to analyze trace quantities of metals in organic mixtures.
- 3.1.2.2 The copper and cadmium ions shall be added from a standard reference concentrate containing copper and cadmium naphthenates dissolved in a mixture certified to contain 500 ppm by weight copper and 500 ppm by weight cadmium. Add 1.0 mL of this concentrate to 999 mL of the other five components.
- 3.1.2.3 Type II fluid shall be not stored in contact with metals (See 5.1.2).

- 3.2 Properties: Fluid shall conform to the following requirements:

- 3.2.1 Color: Shall be no darker than +25 (Saybolt Chromometer), determined in accordance with ASTM D156.
- 3.2.2 Acid and Base Number: Shall not exceed 0.10, determined in accordance with ASTM D664.
- 3.2.3 Copper Strip Corrosion: Shall not exceed ASTM No. 1, determined in accordance with ASTM D130 at 50°C (122°F).
- 3.2.4 Water Tolerance: The fluid shall separate sharply from the water layer, and there shall be no evidence of emulsion, precipitate, or suspended matter within or on either layer, determined in accordance with FED-STD-791, Method 3251. Neither layer shall have changed in volume by more than 2 millilitres.
- 3.3 Quality: The product, as received by purchaser, shall be a clear, homogeneous liquid free from solid particles and from other foreign materials detrimental to usage of the product.

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection: The vendor of the product 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 product conforms to the requirements of this specification.
- 4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and as preproduction tests and shall be performed prior to or on the initial shipment of the product to a purchaser, on each lot, when a change in material and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.
- 4.2.1 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: Shall be in accordance with the following:
- 4.3.1 For Acceptance Tests: Each lot of fluid shall be visually examined for quality (3.3) and sampled at random for all other 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.
- 4.3.1.1 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.

- 4.3.1.2 When a statistical sampling plan and acceptance quality level (AQL) have been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.5 shall state that such plan was used.
- 4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.
- 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, processes, and methods of inspection on production fluid which are essentially the same as those used on the approved sample. If necessary to make any change in material or processing, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in material 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 Reports: The vendor of fluid shall furnish with each shipment a report showing the results of tests to determine conformance to the technical requirements of this specification. This report shall include the purchase order number, AMS 2629, vendor's material identification, lot number, and quantity.
- 4.5.1 A material safety data sheet conforming to AMS 2825, or equivalent, shall be supplied to each purchaser prior to, or concurrent with, the report of preproduction test results or, if preproduction testing be waived by purchaser, concurrent with the first shipment of fluid for production use. Each request for modification of fluid formulation shall be accompanied by a revised data sheet for the proposed formulation.
- 4.6 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the fluid may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the fluid represented and no additional testing shall be permitted. Results of all tests shall be reported.
5. PREPARATION FOR DELIVERY:
- 5.1 Packaging and Identification:
- 5.1.1 Type I fluid shall be packaged in containers, such as welded aluminum, non-galvanized welded steel, or glass, which are inert to the fluid ingredients.