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MIL-PRF-87100A(USAF)
28 November 1997
SUPERSEDING
MIL-L-87100(USAF)
12 November 1976

PERFORMANCE SPECIFICATION

**LUBRICATING OIL, AIRCRAFT TURBINE ENGINE,
POLYPHENYL ETHER BASE**

This specification is approved for use by the Department of the Air Force and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for one grade of aircraft turbine engine lubricating oil.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in *sections 3* and *4* of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in *sections 3* and *4* of this specification, whether or not they are listed.

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| Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: ASC/ENSI, 2530 Loop Road W, Wright-Patterson AFB OH 45433-7101, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter. |
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AMSC N/A

FSC 9150

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

MIL-PRF-87100A(USAF)**2.2 Government documents**

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents will be those listed in the issue of the *Department of Defense Index of Specifications and Standards (DoDISS)* and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

| | |
|------------|--------------------------------------|
| A-A-51057 | Steel, Straight |
| QQ-A-250/4 | Aluminum Alloy 2024, Plate and Sheet |

DEPARTMENT OF DEFENSE

| | |
|-------------|--------------------------|
| MIL-S-13282 | Silver and Silver Alloys |
|-------------|--------------------------|

FEDERAL

| | |
|-------------|--|
| FED-STD-313 | Material Safety Data Sheets, Preparation and Submission of |
| FED-STD-791 | Lubricants, Liquid Fuels, and Related Products; Methods of Testing |

MILITARY

| | |
|-------------|---|
| MIL-STD-290 | Packaging of Petroleum and Related Products |
|-------------|---|

TECHNICAL ORDERS

| | |
|-----------------|---|
| TO 33A6-7-24-11 | Operations and Maintenance Instructions for Fluid Analysis Spectrometer, Type A/E35U-3A |
|-----------------|---|

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Defense Automated Printing Service, 700 Robbins Avenue, Bldg 4D, Philadelphia PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified the issues are those cited in the solicitation.

CODE OF FEDERAL REGULATIONS (CFR)

DEPARTMENT OF LABOR

| | |
|------------------|--|
| 29 CFR 1910.1200 | Occupational Safety and Health Standards – Hazard Communications |
|------------------|--|

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington DC 20402.)

2.3 Non-government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the *DoDISS* cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the *DoDISS* are the issues of the documents cited in the solicitation (see 6.2).

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

AEROSPACE MATERIAL SPECIFICATIONS (AMS)

| | |
|----------|--|
| AMS 4908 | Titanium Alloy Sheet and Strip - 8Mn Annealed, 110,000 psi (760 MPa) Yield Strength (DoD adopted) |
| AMS 5544 | Alloy, Corrosion and Heat Resistant, Sheet, Strip, and Plate 57Ni - 19.5Cr - 13.5Co - 4.2Mo - 3.0Ti - 1.4Al - 0.05Zr - 0.006B, Consumable Electrode or Vacuum Induction Melted, Annealed (DoD adopted) |

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| | |
|----------|--|
| AMS 6260 | Steel Bars, Forgings, and Tubing 1.2Cr – 3.25Ni – 0.12Mo (0.07 – 0.13) (SAE 9310) (DoD adopted) |
| AMS 6475 | Steel Bars, Forgings, and Tubing, Nitriding 1.1Cr – 3.5Ni – 0.25Mo – 1.25Al (0.21 – 0.26C) (DoD adopted) |
| AMS 6490 | Steel Bars, Forgings and Tubing 4.0Cr - 4.2Mo - 1.0V - (0.77-0.85C), Premium Aircraft Quality for Bearing Applications, Consumable Electrode Vacuum Melted (DoD adopted) |

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale PA 15096-0001; telephone (412) 776-4841.)

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

| | |
|------------|---|
| ASQC- Z1.4 | Sampling Procedures and Tables for Inspection by Attributes (DoD adopted) |
|------------|---|

(Application for copies should be addressed to the American Society for Quality Control, PO Box 3005, 611 East Wisconsin Avenue, Milwaukee WI 53201-4606.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|------------|--|
| ASTM D92 | Standard Test Method for Flash and Fire Points by Cleveland Open Cup, (AASHTO No. T48) (DoD-adopted) |
| ASTM D97 | Standard Test Method for Pour Point of Petroleum Products |
| ASTM D445 | Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (And the Calculation of Dynamic Viscosity) (DoD adopted) |
| ASTM D664 | Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration (British Standard 4457) (DoD adopted) |
| ASTM D892 | Standard Test Method for Foaming Characteristics of Lubricating Oils (DoD adopted) |
| ASTM D972 | Standard Test Method for Evaporation Loss of Lubricating Greases and Oils (DoD adopted) |
| ASTM D1218 | Standard Method for Testing Refractive Index and Refractive Dispersion of Hydrocarbon Liquids (DoD adopted) |
| ASTM D1298 | Standard Practice for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum products by Hydrometer Method (DoD adopted) |
| ASTM D1947 | Standard Test Method for Load-Carrying Capacity of Petroleum Oil and Synthetic Fluid Gear Lubricants (DoD adopted) |
| ASTM D2273 | Standard Test Method for Trace Sediment in Lubricating Oils (DoD adopted) |
| ASTM D2532 | Standard Test Method for Viscosity and Viscosity Change After Standing at Low Temperature of Aircraft Turbine Lubricants (DoD adopted) |
| ASTM D2766 | Standard Test Method for Specific Heat of Liquids and Solids (DoD adopted) |
| ASTM D4057 | Standard Practice for Manual Sampling of Petroleum Products |
| ASTM D4177 | Standard Practice for Automatic Sampling of Petroleum and Petroleum Products (DoD adopted) |
| ASTM D4636 | Standard Test Method for Corrosiveness and Oxidation Stability of Hydraulic Oils, Aircraft Turbine Engine Lubricants, and Other Highly Refined Oils |
| ASTM E100 | Standard Specification for ASTM Hydrometers (DoD adopted) |
| ASTM E659 | Standard Test Method for Autoignition Temperature of Liquid Chemicals |

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken PA 19428-2959.)

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2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The lubricating oils furnished under this specification shall be products that are authorized by the Qualifying Activity for listing on the applicable Qualified Products List (QPL) before contract award (see 4.2 and 6.3).

3.2 Materials. The composition of this lubricating oil is not limited; however, known or suspected human carcinogens (as defined by the *Occupational Safety and Health Standards – Hazard Communications, 29 CFR 1910.1200*) are prohibited. The basestock shall be essentially bis(phenoxyphenoxy)benzene. The engine lubricating oil shall have no adverse effect on the health of personnel when used for its intended purpose. Recycled basestocks are permitted; however, each batch must be fully tested in accordance with all qualification requirements of this specification. The manufacturer may be required to submit certification of conformance to this paragraph (see 6.2).

3.3 Chemical and physical requirements. All classifications of the finished lubricating oil shall conform to the requirements listed in *section 3* and *table I* when tested in accordance with the applicable test methods.

3.4 Bench performance requirements. Bench performance requirements shall be as specified in 3.4.1 and 3.4.2.

3.4.1 Bearing deposition. Bearing deposition of the lubricating oil shall be determined in accordance with 4.4.3. Results of the determinations shall comply with the following:

| | |
|--|----------|
| Deposit rating | 60 max |
| Filter deposit weight, g | 2.5 max |
| Oil consumption, ml | 1440 max |
| Viscosity at 40°C, % change | 25 max |
| Acid number change, mg KOH/g | 0.20 max |
| Metal specimen weight change, mg/cm ² | ±0.2 max |

3.4.2 Gear load-carrying capacity. The gear load-carrying capacity shall be conducted as specified in 3.4.2.1 and 3.4.2.2. The average of six determinations shall be required to determine load-carrying capacity. Test results of all determinations shall be included in reporting data.

3.4.2.1 Gear load-carrying capacity requirement conducted at 74°C(165°F). Load-carrying capacity shall be determined in accordance with *ASTM D1947* using AMS 6260 test gears. Only those gear machines having a reference oil “C” average rating within the range 438 to 578 kN/m (2500 to 3300 lbf/in) are acceptable. Test results must include reporting data on all determinations conducted. The average percentage of the relative rating determinations shall be multiplied by the reference oil specified average of 508 kN/m (2900 lbf/in).

| <u>Determinations</u> | <u>Load-Carrying Capacity</u> <u>Avg % Relative Rating x 508 kN/m (2900 lbf/in)</u> |
|-----------------------|--|
| 2 minimum | 336 kN/m (1920 lbf/in) min |

MIL-PRF-87100A(USAF)**TABLE I. Chemical, physical, and performance requirements.**

| Characteristic | Requirement | Test Method | |
|--|--------------------------|-------------|-------------|
| | | ASTM | FED-STD-791 |
| Acid number (T.A.N.), mg KOH/g | 0.05 max ^u | D664 | |
| Viscosity at 260°C (500°F), cs ^u | 1.0 min | D445 | |
| Viscosity at 98.9°C (210°F), cs ^u | 12.5 min | D445 | |
| Viscosity at 37.8°C (100°F), cs ^u | 330 min, 375 max | D445 | |
| Viscosity at -51°C (-60°F) (35% by weight diluent), cs ^u | | D2532 | |
| at 35 minutes | 17 x 10 ³ max | | |
| at 3 hours | 17 x 10 ³ max | | |
| Autoignition temperature °C(°F) | 610(1130) min | E659 | |
| Flash point, °C(°F) | 275(527) min | D92 | |
| Pour point, °C(°F) | 5(41) max | D97 | |
| Evaporation loss at: | | D972 | |
| 260°C(500°F), % ^u | 15 max | | |
| 300°C(572°F), % ^u | 35 max | | |
| Refractive index at 25°C(77°F) | 1.6284 min ; 1.6324 max | D1218 | |
| Trace sediment, ml / 200 ml of oil ^u | 0.005 max | D2273 | |
| Specific gravity at 100°F/60°F ^u | 1.180 min ; 1.200 max | D1298 | |
| Foaming ^z | | D892 | |
| Foam volume, ml at: | | | |
| 24°C(75°F) | 625 max ^u | | |
| 93°C(200°F) | 250 max ^u | | |
| 24°C(after test at 93°C) | 625 max ^u | | |
| Foam volume after 10 minute settle period, ml | | | |
| 24°C(75°F) | 550 | | |
| 93°C(200°F) | none | | |
| 24°C(after test at 93°C) | 550 | | |
| Trace metal content, ppm, maximum ^u | | | |
| Aluminum (Al) | 3 | | |
| Iron (Fe) | 2 | | |
| Chromium (Cr) | 3 | | |
| Silver (Ag) | 1 | | |
| Copper (Cu) | 1 | | |
| Tin (Sn) | 200 min, 400 max | | |
| Magnesium (Mg) | 1 | | |
| Nickel (Ni) | 2 | | |
| Titanium (Ti) | 1 | | |
| Silicon (Si) | 1 | | |

MIL-PRF-87100A(USAF)**TABLE I. Chemical, physical, and performance requirements. (cont)**

| Characteristic | Requirement | Test Method | |
|--|----------------------------------|----------------------------|-------------------------------|
| | | ASTM | FED-STD-791 |
| Specific heat at: 260°C(500°F) 160°C(320°F) 60°C(140°F) | 0.45 min 0.40 min 0.35 min | <i>D2766^{10/}</i> | |
| Compatibility | | | <i>FTM 3403^{12/}</i> |
| Turbidity | none | | |
| Sediment, ml/200 ml oil, maximum <i>MIL-PRF-87100</i> | 0.005 | | |
| Corrosion and oxidation stability at 320°C(608°F) | | <i>D4636</i> | <i>FTM 5307^{12/}</i> |
| Viscosity change at 40°C, % | -5 to +25 max | | |
| Acid number change, mg KOH/g | 0.20 max | | |
| Metal weight change, mg/cm ² | | | |
| Al | ±0.2 max | | |
| Ag | ±0.2 max | | |
| Fe | ±0.2 max | | |
| M-50 | ±0.2 max | | |
| WSP | ±0.2 max | | |
| Ti | ±0.2 max | | |

^{10/} Titrate to a pH 11 end point.^{12/} Viscometer shall be in accordance with ASTM D445. Test conditions will be specified by the activity responsible for qualification (see 6.3).^{3/} Diluent shall be reagent grade.^{4/} Use a 6 hour test period, ambient atmospheric pressure, and a bath temperature controlled within -2°C of test temperature. Air temperature shall be maintained within -2°C of bath temperature, using a preheater if necessary.^{5/} Report total ml sediment per 200 ml of oil instead of average ml sediment per 100 ml of oil.^{6/} Use ASTM 114H-62 hydrometer.^{7/} Report foam collapse period in seconds. Complete foam collapse is adjudged to be that point at which no more than a single row of bubbles remain around the cylinder wall and the air inlet tube. If this ring of bubbles around the cylinder wall contains segments having two or more layers of bubbles and the difference in height of the foam in the ring is not greater than 10 ml, complete foam collapse is adjudged to be that point at which a break occurs in the ring of bubbles without subsequent reforming of the ring.^{8/} Foam volume measurements taken after 5 minute aeration.^{9/} See paragraph (4.4.2) for test method details.^{10/} Values may be calculated from an equation of specific heat vs. temperature derived from minimum of five determinations of enthalpy change made over the specified temperature range. These shall include determinations of enthalpy change made at elevated temperatures within ±20°C(±36° F) of each of the three required test temperatures.^{11/} See paragraph (4.4.4) for test method details.^{12/} See paragraph (4.4.5) for test method details.

3.4.2.2 Gear load-carrying capacity requirement conducted at 220°C(428°F). Load-carrying capacity shall be determined in accordance with *FED-STD-791, Method 6517*, and the following test conditions:

| | |
|----------------------------|------------------------|
| Gear Material | AMS 6475* (Nitalloy N) |
| Gear Temperature | 220±3°C(428±5°F) |
| Test-oil-in-Temperature | 205±3°C(401±5°F) |
| Support Oil-in Temperature | 74±3°C(165±5°F) |

Only those gear machines with a reference oil "C" average rating (using AMS 6260 test gears) within the range of 438 to 578 kN/m (2500 to 3300 lbf/in) are acceptable.

*Gears shall be finished machined including gear tooth profile grinding after nitriding.

| | |
|-----------------------|---|
| <u>Determinations</u> | <u>Avg % Relative Rating x 508 kN/m (2900 lbf/in)</u> |
| 2 minimum | 168 kN/m (960 lbf/in) min |

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3.5 Workmanship. The finished lubricating oil shall be transparent and uniform in appearance, and free from cloudiness, suspended matter, or other adulterations when examined visually by transmitted light.

3.6 Material safety data sheets. Material safety data sheets shall be prepared and submitted in accordance with *FED-STD-313* (see 6.4).

4. VERIFICATION

4.1 Classification of inspections. The inspection and testing of lubricating oils shall be classified as follows:

- a. Qualification inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 Qualification inspection. Qualification inspection shall consist of testing to all the requirements specified in *section 3* and *table I*. When required by the qualifying activity, additional evaluations (engine test) may be required on candidate formulations.

4.2.1 Qualification inspection sample. The qualification test sample shall consist of 76 liters (20 gallons) packaged in 19 liter (5 gallon) polyethylene lined containers. In addition, 19 liters (5 gallons) of the base oil blend (without additives), 0.95 liter (1 quart) of each basestock blend ingredient (without additives), and a minimum of 100 grams (3.5 ounces) of each additive ingredient used in the manufacture of the qualification test sample shall be submitted prior to qualification. Each lubricant ingredient submitted shall be from the same bulk lot used in preparation of the qualification test sample. Upon receiving authorization from AFRL/PRSL, these samples shall be forwarded to AFRL/PRSL, Bldg 490, 1790 Loop Road North, Wright-Patterson AFB OH 45433-7103. Each sample shall be plainly identified by a securely attached, durable label marked with the following information:

**QUALIFICATION INSPECTION SAMPLE
LUBRICATING OIL, AIRCRAFT TURBINE ENGINE,
MIL-PRF-87100**

Type of sample: (basestock, additive, or finished oil)

Name of manufacturer:

Product code number:

Batch number:

Date of manufacture:

Submitted by (name) on (date) for qualification inspection in accordance with *MIL-PRF-87100* under authorization of (reference authorization letter, see 6.3).

4.2.2 Qualification inspection test report. The manufacturer shall forward a letter to the activity responsible for qualification (see 6.3) before the test sample is supplied. The letter shall contain the following:

- a. Request for authorization to submit test sample for qualification.
- b. Certified test report that contains data on the specific batch of test sample to be submitted showing results of the tests specified herein except trace element content, viscosity at 260°C (500°F), and compatibility.
- c. Complete formulation data, including chemical composition, percentages of each ingredient, the manufacturer and trade name of each ingredient, and the purity of each ingredient. Formulation data will be respected as highly proprietary information.
- d. Verification that the composition of the test sample complies with the requirements of 3.2.
- e. Identification of the manufacturing site of the specific batch of test sample to be submitted.
- f. MSDS (see 3.6) of the candidate product and for each of the additive components used in the formulation.

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4.2.3 Requalification. Requalification shall be required when any change is made in source of manufacture, purity, or composition of the lubricating oil base stocks or additives. A minor change in the oil formulation may be made without requalification testing, but only after notification to, and approval by, the qualifying activity (see 6.3). Each reformulation request shall include a certified test report (see 4.2.2).

4.3 Conformance inspection. Conformance inspection of production lots shall consist of all the tests specified in *table II*. Failure of production lots to pass any of the conformance tests shall be cause for rejection of the lot.

4.3.1 Sampling. Each bulk lot (see 6.7) of material shall be sampled at random in accordance with *ASTM D4057* and *ASTM D4177* for the conformance inspection tests (see 4.3).

4.3.2 Inspection. Inspections shall be conducted in accordance with *FED-STD-791, method 9601*, "Inspection Requirements."

4.3.2.1 Examination of filled containers. A random sample of filled containers from each lot (see 6.7), taken in accordance with *ASQC-Z1.4*, shall be examined for conformance to *MIL-STD-290* with regard to fill, closure, sealing, leakage, packaging, packing, and markings. Reject any container having one or more defects or for being under the required fill. If the number of defective or underfilled containers exceeds the accepted number for the appropriate sampling plan of *ASQC-Z1.4*, reject the lot represented by the sample.

4.3.3 Conformance inspection test report. A copy of the conformance inspection report on each lot of oil produced for US Government use shall be forwarded to the Propulsion Directorate, AFRL/PRSL, Bldg 490, 1790 Loop Road North, Wright-Patterson AFB OH 45433-7103.

4.4. Test methods. All tests shall be performed in accordance with *tables I and II*, and 4.4.1 through 4.4.5.

4.4.1 Additional tests. At the time of qualification, the right is reserved to subject the oil to such additional tests as are considered necessary to assure the serviceability of the material.

4.4.2 Trace metal content. The trace metal content of the oil shall be determined with an atomic emission (A/E 35U-3 or FAS-2C) spectrometer. Using JOAP spectrometric standards, the spectrometer shall be calibrated in accordance with paragraphs 4-32, 4-33, 4-46, and 4-47 of *Air Force Technical Order 33A6-7-24-11*. Immediately after standardizing the spectrometer, 5 determinations of the oil for trace metal content shall be performed. The average of the 5 determinations shall be reported. Samples which require trace metal content determinations may be sent with a request for analysis to:

Joint Oil Analysis Program
Technical Support Center
ATTN: JOAP Lab
296 Farrar Road
Pensacola FL 32508-5010

4.4.3 Bearing deposition. To determine compliance with the requirements of 3.4.1, bearing test determinations shall be conducted in accordance with *FED-STD-791, Method 3450*, and the following:

| Test conditions | Metal specimens |
|---|---|
| Test-oil sump Temperature: 300°C(572°F) | Aluminum (QQ-A-250/4, T3 or T4) |
| Bearing Temperature: 360°C(680°F) | Silver (Mil-S-13282, Grade A) |
| Test-oil in Temperature: 295°C(563°F) min | Mild Steel (A-A-51057, Grade 1009, cold |
| Test-oil return Temperature: 280°C(536°F) min | rolled, condition No. 4 or 5) |
| | M-50 Steel (AMS 6490) |
| | Waspaloy (AMS 5544) |
| | Titanium (AMS 4908) |

Suitable insulation should be appropriately applied to achieve the required test-oil in temperature and the test-oil return temperature.

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4.4.3.1 Reported data. Test results of all determinations shall be included in reporting data. The following shall also be reported: (a) bearing stabilization temperature, (b) major item deposit demerits, and (c) major item colored photographs.

TABLE II: Conformance tests.

| Characteristic | Test | Test Method | |
|--|------------------|--------------------|--------------|
| | Paragraph | FED-STD-791 | ASTM |
| Trace metal content, ppm max (see <i>table I</i>) | 4.4.2 | | |
| Corrosion and oxidation stability (see <i>table I</i>) | 4.4.5 | <i>FTM 5307</i> | <i>D4636</i> |
| Refractive index at 25°C(77°F) (see <i>table I</i>) | | | <i>D1218</i> |
| Gear load-carrying capacity at 74°C(165°F) | 3.4.2 | | <i>D1947</i> |
| Flash point, °C (°F) (see <i>table I</i>) | | | <i>D92</i> |
| Pour point °C(°F) (see <i>table I</i>) | | | <i>D97</i> |
| Evaporation loss, at 260 °C (500 °F), % (see <i>table I</i>) | | | <i>D972</i> |
| Acid number, mg KOH/g (see <i>table I</i>) | | | <i>D664</i> |
| Specific gravity at 100°F/60°F (see <i>table I</i>) | | | <i>D1298</i> |
| Viscosity (see <i>table I</i>), cSt at 98.9 °C (210 °F) at 37.8 °C (100 °F) | | | <i>D445</i> |
| Foam volume, ml (see <i>table I</i>) at 24°C(75°F) at 93°C(200°F) at 24°C(after test at 93°C) after 10 minute settle period, ml at 24°C(75°F) at 93°C(200°F) at 24°C(after test at 93°C) | | | <i>D892</i> |
| Trace sediment, ml/200 ml of oil(max) (see <i>table I</i>) | | | <i>D2273</i> |

4.4.4 Compatibility. The compatibility test shall be performed in accordance with *FED-STD-791, Method 3403*. The lubricating oil shall be mixable with selected referee lubricating oils qualified under this specification without turbidity. Upon completion of the 168-hour oven period, the test flasks shall be stored in the dark, at a room temperature of 25 °C \pm 5 °C (77 °F \pm 9 °F), for 21 days before visual inspection for turbidity and centrifuging. Centrifuge tubes with a small scale division of 0.005 ml or less shall be used. (DeLaval centrifuge tube, part 14209, or equivalent, is acceptable.) The volume of sediment shall be determined in accordance with *ASTM D2273*. The sediment shall be centrifuged from a 200 ml oil sample. The volume of sediment for mixtures which involve oils covered under this specification shall not exceed 0.005 ml per 200 ml of oil.

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4.4.5 Corrosion and oxidation stability test. The oil shall be evaluated in the corrosion and oxidation stability test in accordance with *Method 5307 of FED-STD-791* at the conditions specified below.

The test duration shall be 48 hours at 10 liters/hr dry airflow with no intermediate 10 ml samples withdrawn. The test temperature shall be 320°C (608°F) and the metal specimens shall be:

| | |
|--------|---|
| Bottom | Aluminum (<i>QQ-Q-250/4, T3 or T4</i>) |
| | Silver (<i>MIL-S-13282, Grade A</i>) |
| | Mild Steel (<i>AA-S-51057, Grade 1009, cold rolled, condition No. 4 or 5</i>) |
| | M-50 Steel (<i>AMS 6490</i>) |
| | Waspaloy (<i>AMS 5544</i>) |
| Top | Titanium (<i>AMS 4908</i>) |

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. This lubricating oil is intended for use in specific models of aircraft turbine engines and power equipment requiring a polyphenyl ether base oil with a high temperature capability of +300°C (572°F). This oil is not suitable for use below +15°C (+59°F) without proper dilution.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- Title, number, and date of this specification, including any amendments.
- Issue of *DoDISS* to be cited in the solicitation and, if required, the specific issue of individual documents referenced (see 2.2 and 2.3).
- Type and size of containers required (see 5.1).
- Quantity desired.
- Submittal of conformance test results (see 4.3.3).
- If certification of conformance to material prohibitions is required (see 3.2).

6.3 Qualification. With respect to products which require qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in the applicable Qualification Products List whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products they propose to offer to the Federal Government tested for qualification, in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Propulsion Directorate, ATTN: AFRL/PRSL, Bldg 490, 1790 Loop Road North, Wright-Patterson AFB OH 45433-7103, and information pertaining to qualification of products may be obtained from that activity. To initiate the qualification process, prospective suppliers will forward a written request for such action to the Propulsion Directorate at the above address. This letter will contain general information on the proposed candidate material. The Propulsion Directorate will respond, providing detailed instructions for the submission of product samples and test data.

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6.3.1 Reblend lubricating oil qualification. A reblend lubricating oil is an original qualified lubricating oil as specified in 4.2, in which one or more ingredients have been blended by a manufacturer other than the manufacturer of the original formulation. A bulk lot of the reblended oil will be subjected to the qualification tests (see 4.2). Reblend approvals may be initiated by the process described in 6.3.

6.3.2 Rebrand lubricating oil qualification. A rebrand lubricating oil is a qualified, fully-formulated oil which has successfully passed all qualification tests (see 4.2) and is manufactured by the original formulator at the original manufacturing site but which is packaged by a supplier other than the manufacturer of the fully-formulated oil. Rebrand approvals may be initiated by the process described in 6.3.

6.4 Material Safety Data Sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with *FED-STD-313*. The pertinent Government mailing addresses for submission of data are listed in *FED-STD-313*.

6.5 Subject term (key word) listing.

aircraft engine oil
turbine engine lubricating oil
viscosity

6.6 International standardization agreements. Certain provisions of this specification are the subject of international standardization agreements (*ASCC Air Standard 15/9* and *STANAG 1135*). When amendment, revision, or cancellation of this specification is proposed which will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels, including departmental standardization offices, to change the agreement or make other appropriate accommodations.

6.7 Definitions.

| | |
|----------------|---|
| Bulk lot - | A bulk lot is defined as an indefinite quantity of a homogeneous mixture of material offered for acceptance in a single, isolated container or manufactured by a single plant run (not to exceed 24 hours), through the same processing equipment, with no change in ingredient material. |
| Packaged lot - | A packaged lot is defined as an indefinite number of 208-liter (55-gallon) drums or smaller unit packages of identical size and type offered for acceptance and filled with a homogeneous mixture of material from one isolated container or filled with a homogeneous mixture of material manufactured by a single plant run (not to exceed 24 hours), through the same processing equipment, with no change in ingredient material. |

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes. The changes are due to Acquisition Reform initiatives requiring Government specifications to be performance-based. These changes have no impact on the chemical, physical, or performance requirements with respect to the previous issue.

Custodians:
Air Force - 11

Preparing activity:
Air Force - 11

Review activities:
Air Force - 68

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL**INSTRUCTIONS**

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
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I RECOMMEND A CHANGE:**1. DOCUMENT NUMBER****MIL-PRF-87100A(USAF)****2. DOCUMENT DATE (YYMMDD)****97/11/28****3. DOCUMENT TITLE****LUBRICATING OIL, AIRCRAFT TURBINE ENGINE, POLYPHENYL ETHER BASE****4. NATURE OF CHANGE** (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)**5. REASON FOR RECOMMENDATION****6. SUBMITTER****a. NAME** (Last, Middle Initial)**b. ORGANIZATION****c. ADDRESS** (include Zip Code)**d. TELEPHONE** (Include Area Code)
(1) Commercial**e. DATE SUBMITTED**
(YYMMDD)(2) AUTOVON
(If applicable)**8. PREPARING ACTIVITY****a. NAME**ASC/ENSI
AF CODE 11**b. TELEPHONE** (Include Area Code)(1) Commercial
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785-0175**c. ADDRESS** (Include Zip Code)2530 LOOP ROAD WEST
WRIGHT-PATTERSON AFB OH 45433-7101**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:**Defense Quality and Standardization Office
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