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METRIC

MIL-PRF-32644(AS)
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PERFORMANCE SPECIFICATION

LUBRICATING OIL, CATAPULT LAUNCH ENGINE

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

1. SCOPE

1.1 Scope. This specification covers one grade of lubricating oil for use in the steam catapult launch engine.

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 of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

Comments, suggestions, or questions on this document should be addressed to Commander, Naval Air Warfare Center Aircraft Division Lakehurst, Mail Stop 120-3, Route 547, Joint Base MDL, NJ 08733-5100 or emailed to michael.sikora@navy.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST online database at https://assist.dla.mil.

AMSC N/A FSC 9150

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FEDERAL STANDARD

FED-STD-313	-	Material Safety Data, Transportation Data, and Disposal Data for Hazardous Materials Furnished to Government Activities

(Copies of this document are available online at https://quicksearch.dla.mil/.)

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 these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

ASTM D92	-	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D97	-	Standard Test Method for Pour Point of Petroleum Products
ASTM D129	-	Standard Test Method for Sulfur in Petroleum Products (General High Pressure Decomposition Device Method)
ASTM D130	-	Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test
ASTM D445	-	Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
ASTM D482	-	Standard Test Method for Ash from Petroleum Products
ASTM D664	-	Standard Test Method for Acid Number for Petroleum Products by Potentiometric Titration
ASTM D892	-	Standard Test Method for Foaming Characteristics of Lubrication Oils
ASTM D1298	-	Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method
ASTM D1552	-	Standard Test Method for Sulfur in Petroleum Products by High Temperature Combustion and Infrared (IR) Detection or Thermal Conductivity Detection (TCD)
ASTM D2270	-	Standard Practice for Calculating Viscosity Index from Kinematic Viscosity at 40 °C and 100 °C
ASTM D2272	-	Standard Test Method for Oxidation Stability of Steam Turbine Oils by Rotating Pressure Vessel
ASTM D2273	-	Standard Test Method for Trace Sediment in Lubricating Oils

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ASTM D2622	-	Standard Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry
ASTM D2783	-	Standard Test Method for Measurement of Extreme-Pressure Properties of Lubricating Fluids (Four-Ball Method)
ASTM D4052	-	Standard Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter
ASTM D4057	-	Standard Practice for Manual Sampling of Petroleum and Petroleum Products
ASTM D4172	-	Standard Test Method for Wear Preventive Characteristics of Lubricating Fluid (Four-Ball Method)
ASTM D4177	-	Standard Practice for Automatic Sampling of Petroleum and Petroleum Products
ASTM D4683	-	Standard Test Method for Measuring Viscosity of New and Used Engine Oils at High Shear Rate and High Temperature by Tapered Bearing Simulator Viscometer at 150 °C
ASTM D4741	-	Standard Test Method for Measuring Viscosity at High Temperature and High Shear Rate by Tapered-Plug Viscometer
ASTM D4951	-	Standard Test Method for Determination of Additive Elements in Lubricating Oils by Inductively Coupled Plasma Atomic Emission Spectrometry
ASTM D5185	-	Standard Test Method for Multielement Determination of Used and Unused Lubricating Oils and Base Oils by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)
ASTM D5481	-	Standard Test Method for Measuring Apparent Viscosity at High-Temperature and High-Shear Rate by Multicell Capillary Viscometer
ASTM D5949	-	Standard Test Method for Pour Point of Petroleum Products (Automatic Pressure Pulsing Method)
ASTM D5950	-	Standard Test Method for Pour Point of Petroleum Products (Automatic Tilt Method)
ASTM D5985	-	Standard Test Method for Pour Point of Petroleum Products (Rotational Method)

(Copies of these documents are available online at https://www.astm.org.)

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2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein (except related specification sheets), 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 First article. When specified (see 6.2), lubricating oil samples shall be subjected to first article testing in accordance with 4.3.

3.2 Materials. The lubricating oil shall be a refined petroleum product and may contain pour point depressants up to a maximum of 1.0 percent by weight as well as an antioxidant in an amount not to exceed 0.5 percent by weight. Silicon antifoam additives may be used up to a maximum of 25 ppm.

3.3 Chemical and physical properties. The finished lubricating oil shall conform to the physical and chemical property requirements in Table 1.

3.4 Sulfur. The sulfur content of the oil shall not exceed the value shown in Table 1. For quality conformance inspection, the sulfur content shall be within a ±0.15 percent mass of the first article value or within a 0.3 percent mass range selected by the manufacturer to bracket the first article value.

3.5 API gravity. The American Petroleum Institute (API) gravity of the oil shall be determined on first article inspection. For quality conformance inspection, the gravity shall be within ±1.0 °API of the first article value, or within a 2.0 °API range selected by the manufacturer to bracket the first article value.

3.6 Workmanship. The lubricating oil shall be a homogenous blend when examined visually at room temperature (25 °C ±3 °C) in a well-lighted room or in daylight. It shall exhibit no separation or fallout of the additive package. A jelly-like substance or very viscous material observed in the bottom of the container will be evidence of additive fallout.

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TABLE I. Chemical and physical property requirements for finished lubricant.

Characteristic	Requirement	Test Method	Conformance Inspection
Viscosity, mm^2/s (cSt),		ASTM D445	Required
@ 100 °C, Min	21.9		
@ 100 °C, Less than	26.1		
@ 40 °C	report		
Viscosity Index, Min	95	ASTM D2270	Required
Viscosity, High Temp., High Shear, @ 150 °C, cP, Min	3.7	ASTM D4683 ASTM D4741 ASTM D5481	Not Required
Flash Point, °C Min	243	ASTM D92	Required
Pour Point, °C Max	-9	ASTM D97 ASTM D5949 ASTM D5950 ASTM D5985	Required
Sulfur, Mass % Max	1.2	ASTM D129 ASTM D1552 ASTM D2622 ASTM D4951 ASTM D5185	Required
Acid Number, mg KOH/g, Max 1/	1.0	ASTM D664	Required
Density, @ 15 °C, g/mL	report	ASTM D4052	Required
Gravity, @ 15.6 °C (60 °F), °API 2/	report	ASTM D1298 ASTM D4052	Required
Ash Content, Mass % Max	0.011	ASTM D482	Required
Trace Sediment, mL/100 mL Oil, Max	0.005	ASTM D2273	Not Required
Copper Strip Corrosion, Max Rating 3/		ASTM D130	Required
3 h @ 100 °C	1		
3 h @ 204 °C	3		
Foaming Tendency/Stability		ASTM D892	Required
Seq. I			
Aerated Vol., mL Max	50		
Vol. after 10 min, mL Max	0		
Seq. II			
Aerated Vol., mL Max	50		
Vol. after 10 min, mL Max	0		
Seq. III			
Aerated Vol., mL Max	50		
Vol. after 10 min, mL Max	0		
Oxidation Stability, Minutes, Min	80	ASTM D2272	Not Required
Four-Ball Wear Test (Avg of 3), 40 kg load, Wear Scar Diameter, mm, Max	0.75	ASTM D4172	Not Required
Four-Ball EP Test (Avg of 3)		ASTM D2783	Not Required
Weld Point, kg, Min	200		
Load Wear Index, Min	20.0		
Workmanship 4/	4/	4/	Required

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1/ Titrate to a pH 11 end point.

2/ API gravity may be computed from the relative density measured by ASTM D4052.

3/ Conduct the test in accordance with ASTM D130 but at the temperature specified.

4/ See 3.6.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.3).
b. Conformance inspection (see 4.4).

4.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in the applicable test method.

4.2.1 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy and quantity to permit performance of the required inspection shall be established and maintained by the manufacturer.

4.3 First article inspection. First article inspection shall be performed on a random sample drawn in accordance with ASTM D4057 or ASTM D4177 from the first production lot of the finished lubricant. First article inspection shall consist of subjecting the sample of the finished lubricant to examination and testing to determine conformance to all of the requirements specified in section 3. A copy of the first article test report shall be forwarded to Commander, Naval Air Warfare Center Aircraft Division Lakehurst, Steam Catapult ALRE* Engineering Branch, BL51430, Bldg. 596, Route 547, Joint Base MDL, NJ 08733-5100.

4.4 Conformance inspection. Conformance inspection shall consist of all tests in Table II. Oil manufacturers shall retain a copy of each lot test report in their files for at least five years. A copy of the test report on each lot of oil produced for the U.S. Government shall be forwarded to Commander, Naval Air Warfare Center Aircraft Division Lakehurst, Steam Catapult ALRE Engineering Branch, BL51430, Bldg. 596, Route 547, Joint Base MDL, NJ 08733-5100.

4.4.1 Lot formation.

4.4.1.1 Bulk lot. A bulk lot is considered as an indefinite quantity of homogeneous mixture of material in a single isolated container or manufactured by a single plant run (not exceeding 24 hrs) through the same processing equipment, with no change in ingredient material.

4.4.1.2 Packaged lot. A packaged lot is considered as an indefinite number of 208 L (55 gal) drums or smaller unit packages of identical size and type filled with a homogenous mixture of material manufactured by a single plant run (not exceeding 24 hours) through the same processing equipment, with no change in ingredient material.

4.4.2 Sampling for conformance inspection. Each bulk and packaged lot of finished lubricant shall be sampled in accordance with ASTM D4057 or ASTM D4177 for verification of product quality as specified in 4.4.

*ALRE (Aircraft Launch and Recovery Equipment)

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TABLE II. Conformance inspections.

Inspection	Requirement paragraph	Test paragraph
Viscosity	3.3	4.5
Viscosity Index	3.3	4.5
Flash Point	3.3	4.5
Pour Point	3.3	4.5
Sulfur	3.4	4.5
Acid Number	3.3	4.5
Density	3.3	4.5
Gravity	3.5	4.5
Ash Content, Mass % Max	3.3	4.5
Copper Strip Corrosion	3.3	4.5
Foaming Tendency/Stability	3.3	4.5
Workmanship	3.6	4.5

4.5 Test methods. Tests shall be performed in accordance with the applicable methods of Table 1.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house manufacturer personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's systems commands. 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 steam catapult launch engines.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of the specification.
b. When first article inspection is required (see 3.1).
c. Packaging (see 5.1).
d. Certification (see 6.4.2)
e. Test condition waiver if required (see 6.6)

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f. Minimum package identification information should include: nomenclature, part or identifying number, contract number, CAGE code, date manufactured, lot manufactured, and quantity.

6.3 First article sample and inspection for a subsequent contract. If a manufacturer has previously furnished the lubricant in accordance with the requirements of this specification and that product has been found to be satisfactory, the requirement for a first article sample and its submittal for any subsequent contract or order may be waived. Waiver is at the discretion of Commander, Naval Air Warfare Center Aircraft Division Lakehurst, Steam Catapult ALRE Engineering Branch, BL51430, Bldg. 596, Route 547, Joint Base MDL, NJ 08733-5100.

6.4 Conformance inspection information.

6.4.1 Certification. The manufacturer at the time of conformance inspection will certify that there has been no formulation or process change from that which resulted in the production of the first article inspection sample.

6.4.2 Conformance rejection and retest. Failure of any conformance inspection will result in the rejection of the lot from which it was obtained. Rejected material cannot be resubmitted for acceptance without written approval from the responsible activity (see 6.3.1).

6.5 Safety Data Sheets. A Safety Data Sheet (SDS) must be prepared and submitted in accordance with FED-STD-313. Contracting officers will identify those activities requiring copies of completed SDSs. In order to obtain the SDS, FAR clause 52.223-3 must be in the contract.

6.6 Inspection condition waiver. A waiver of the test condition requirement is permitted when proper conditioning facilities are not available for control testing. However, for referee purposes, the specified tests must be performed under the specific atmospheric conditions.

6.7 Subject term (key word) listing.

Petroleum
Viscosity

CONCLUDING MATERIAL

Custodian:
Navy - AS

Preparing activity:
Navy-AS

Project 9150-2020-002

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla.mil.