

INCH-POUND

MIL-PRF-6081E
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PERFORMANCE SPECIFICATION

LUBRICATING OIL, JET ENGINE

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

1. SCOPE

1.1 Scope.

This specification covers the requirements for three grades of jet engine lubricating oil.

1.2 Classification.

The lubricating oil will be furnished in the following grades, as specified:

<u>GRADE</u>	<u>NATO Code Number</u>
1005	---
1010	O-133
1010N	---

Comments, suggestions, or questions on this document should be addressed to AFLCMC/ENRS, 2145 Monahan Way, Bldg. 28, Wright-Patterson AFB OH 45433-7017 or e-mailed to ENGINEERING.STANDARDS@US.AF.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

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

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, standards, and handbooks 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.

FEDERAL STANDARDS

FED-STD-313	Material Safety Data, Transportation Data, and Disposal Data for Hazardous Materials Furnished to Government Activities
FED-STD-791	Testing Method of Lubricants, Liquid Fuels, and Related Products

(Copies of these documents are available online at <http://quicksearch.dla.mil/>.)

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 of these documents are those cited in the solicitation or contract.

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.1200	Occupational Safety and Health Standards – Hazard Communication
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(Copies of this document are available online at <http://ecfr.gpoaccess.gov/>.)

DEFENSE STANDARDIZATION PROGRAM OFFICE

SD-6	Provisions Governing Qualification: Qualified Products Lists and Qualified Manufacturers Lists
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(Copies of this document are available online at <http://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.

AMERICAN SOCIETY FOR QUALITY (ASQ)

ANSI/ASQ Z1.4	Sampling Procedures and Tables for Inspection by Attributes
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(Copies of this document are available online at <http://www.asq.org/>.)

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ASTM INTERNATIONAL

ASTM D92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester (DoD adopted)
ASTM D97	Standard Test Method for Pour Point of Petroleum Products (DoD adopted)
ASTM D130	Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test (DoD adopted)
ASTM D445	Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity) (DoD adopted)
ASTM D664	Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration (DoD adopted)
ASTM D974	Standard Test Method for Acid and Base Number by Color-Indicator Titration (DoD adopted)
ASTM D1500	Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale) (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 D4636	Standard Test Method for Corrosiveness and Oxidation Stability of Hydraulic Oils, Aircraft Turbine Engine Lubricants, and Other Highly Refined Oils (DoD adopted)

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

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, 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 jet engine lubricating oils furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list 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 (see 29 CFR 1910.1200) are prohibited. The lubricating oil may contain oxidation inhibitors and pour-point depressants. The engine lubricating oil shall have no adverse effect on the health of personnel when used for its intended purpose. Recycled base stocks 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).

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3.2.1 Ozone depleting chemicals.

The following test currently requires the use of toxic or ozone depleting chemicals (ODCs), but an acceptable substitute has been identified for the test.

<u>ASTM Test Method</u>	<u>Toxic Chemicals/ ODC Substance</u>	<u>Acceptable Substitute</u>
ASTM D2532	Toluene	n-Heptane

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.

TABLE I. Chemical, physical, and performance requirements.

Characteristics	Requirement		Test Method	
	Grade 1005	Grade 1010/1010N	ASTM	FED-STD-791
Total Acid Number (T.A.N.), mg KOH/g	0.10 max	0.10 max	D664/ D974	
Viscosity at: 37.8 °C (100 °F), mm ² /s -40 °C (-40 °F), mm ² /s -54 °C (-65 °F), mm ² /s	5.0 min 2600 max	10.0 min 3000 max	D445 D2532 D2532	
Viscosity stability mm ² /s, % change @ 3 hours -54 °C (-65 °F) -40 °C (-40 °F)	3 max ^{1/}	2 max ^{1/}	D2532 D2532 D2532	
Flash point	107 °C (225 °F) min	132 °C (270 °F) min	D92	
Pour point		-57 °C (-70 °F) max	D97	
ASTM Color	No. 5.5 max	No. 5.5 max	D1500	
Copper strip corrosion At 100 ±1 °C (212 ±2 °F)	1 max	1 max	D130	
Corrosion and oxidation stability at 121 °C (250 °F) ^{2/} Post Test Oil Properties Viscosity change, % ^{3/} Acid number change Sludge volume, mL	-5 to +20 max 0.2 max 0.0 mL max	-5 to +20 max 0.2 max 0.0 mL max	D4636	

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TABLE I. Chemical, physical, and performance requirements - Continued.

Characteristics	Requirement		Test Method	
	Grade 1005	Grades 1010 / 1010N	ASTM	FED-STD-791
Post Test Metal Specimen				
Weight change, mg/cm ² ^{4/}				
Copper	± 0.2 max	± 0.2 max		
Steel	± 0.2 max	± 0.2 max		
Aluminum alloy	± 0.2 max	± 0.2 max		
Magnesium alloy	± 0.2 max	± 0.2 max		
Cadmium-plated steel	± 0.2 max	± 0.2 max		
Trace sediment, (mL/200 mL of oil) ^{5/}	0.005 mL max ^{6/}	0.005 mL max ^{6/}	D2273	
Grade 1010N sediment requirement, mg/L		2.0 max		3010.1
<p>^{1/} Viscosity measurement taken at the specified temperature after three hours at test temperature, 121 °C (250 °F).</p> <p>^{2/} Measurements taken after metal has been subjected to the lubricating oil for 168 hours at 121 °C (250 °F).</p> <p>^{3/} Compared with viscosity of new oil samples tested at 37.8 °C (100 °F).</p> <p>^{4/} There shall be no pitting, etching or visible corrosion on the surface of any of the metals when viewed under a magnification of 20 diameters. A slight brown stain on the surface of the copper shall be permitted, but dark brown, gray, or black stain shall be cause for rejection. A slight discoloration of the cadmium will be permitted.</p> <p>^{5/} When using ASTM D2273 to determine presence of trace sediment in the lubricating oil, no diluents shall be used.</p> <p>^{6/} Measurements taken after centrifuging.</p>				

3.4 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.

3.5 Safety data sheets (SDS).

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 requirements specified herein are classified as follows:

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

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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 may be required on candidate formulations.

4.2.1 Qualification process.

The general outline of the qualification process (see 6.3) is described in the SD-6.

4.2.2 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 qualification activity. Two specific requalification categories of the lubricating oil are reblend and rebrand (see 6.3.1 and 6.3.2). Each reformulation request shall include a certified test report (see 4.2.4).

4.2.3 Qualification inspection sample.

The qualification test sample shall consist of two gallons of finished lubricating oil, one gallon of the petroleum oil-base stock before the addition of ingredients, and one ounce of each of the additive ingredients used in the manufacture of the qualification sample; and shall be submitted prior to qualification. In the event that additives are supplied as concentrated solutions, an equivalent quantity of the solution shall be furnished. Each lubricant ingredient shall be from the same bulk lot (see 6.6) used in preparation of the qualification test sample. Upon receiving authorization from AFRL/RQTM, these samples shall be forwarded to AFRL/RQTM, Mechanical Systems Branch, 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, JET ENGINE****MIL-PRF-6081**

Type of sample: (base stock, additive, or finished oil)

Classification of oil: (Grade 1005, Grade 1010, or Grade 1010N)

Name of manufacturer/CAGE Code:

Product code number:

Batch number:

Date of manufacture:

Submitted by (name) on (date) for qualification inspection in accordance with MIL-PRF-6081 under authorization of (reference authorization letter) (see 6.3).

4.2.4 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.
- 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.

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- 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. SDS (see 3.5) of the candidate product and for each of the additive components used in the formulation.

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.

TABLE II. Conformance tests.

Characteristics	Test Method
Copper strip corrosion (see Table I)	ASTM D130
Viscosity stability at -54 °C (-65 °F) and -40 °C (-40 °F), % ^{1/}	ASTM D2532
Total acid number, mg KOH/g (see Table I)	ASTM D664/D974
Viscosity (see Table I), mm ² /s at 37.8 °C (100 °F) at -40 °C (-40 °F) at -54 °C (-65 °F)	ASTM D445 ASTM D2532 ASTM D2532
Flash point °C (°F) (see Table I)	ASTM D92
Pour point °C (°F) (see Table I)	ASTM D97
ASTM color (see Table I)	ASTM D1500
Trace sediment in lubricating oils (see Table I)	ASTM D2273 FED-STD-791, 3010.1
^{1/} Viscosity measurements taken at the specified temperature after three hours at test temperature, 121 °C (250 °F).	

4.3.1 Examination of filled containers.

A random sample of filled containers from each packaged lot (see 6.6), taken in accordance with ANSI/ASQ-Z1.4, shall be examined with regard to fill, closure, sealing and leakage.

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 contractor 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 system 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.

The lubricating oils grades 1005 and 1010 (NATO Code Number O-133) are intended for the use in specific models of military aircraft jet engines. Lubricating oil grade 1010N is intended for use as a preservative fluid for aircraft fuel system components and equipment.

6.2 Acquisition requirements.

Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Grade required (see 1.2).
- c. If certification of conformance to material prohibitions is required (see 3.2).
- d. Quantity desired (see 4.2.3).
- e. Submittal of conformance test results (see 4.3).
- f. Packaging requirements (see 5.1).

6.3 Qualification.

With respect to products requiring qualification, awards will be made only for products which are, at the time of the award of contract, qualified for inclusion in Qualified Products List QPL No. 6081 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 that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from AFRL/RQTM, Mechanical Systems Branch, Bldg. 490, 1790 Loop Road North, Wright-Patterson AFB, OH 45433-7103. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.dla.mil/>.

6.3.1 Reblend lubricating oil qualification.

A reblend lubricating oil is an original qualified lubricating oil as specified in 4.2, into 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 Safety Data Sheets.

Contracting officers will identify those activities requiring copies of completed 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.

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6.5 Subject term (key word) listing.

Flash point
 Heptane
 Safety data sheets
 Preservative fluid
 Sediment
 Thermal stability
 Viscosity

6.6 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.

6.7 International standardization agreement implementation.

This specification implements ASIC Air Standard ACS (FG) 4024, Interchangeability Chart of Standardized Aviation Fuels, Lubricants and Associated Products, and STANAG 1135, Interchangeability of Fuels, Lubricants and Associated Products Used by the Armed Forces of the North Atlantic Treaty Nations. When amendment, revision, or cancellation of this specification is proposed, the preparing activity must coordinate the action with the U.S. National Point of Contact for the international standardization agreement, as identified in the ASSIST database at <https://assist.dla.mil>.

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.

CONCLUDING MATERIAL

Custodians:

Navy – AS
 Air Force – 20

Preparing activity:

Air Force – 20

(Project No. 9150-2014-004)

Review activity:

Air Force – 68

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 this information above using the ASSIST Online database at <https://assist.dla.mil>.